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THE

PHOTOGRAPH MANUAL;

A PRACTICAL TREATISE,

CONTAINING THE

CARTES DE VISITE PROCESS,

AND THE METHOD OF TAKING

STEREOSCOPIC PICTURES,

INCLUDING

THE ALBUMEN PROCESS, THE DRY COLLODION PROCESS, THE TANNIN PROCESS, THE VARIOUS ALKALINE TONING BATHS, ETC., ETC.

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PREFACE

TO THE EIGHTH EDITION.

It is only five years since the first edition of this Manual was announced to the Photographic World, then mainly devoted to the Ambrotype, since which time it has rapidly increased in favor and demand.

The new discoveries in this beautiful art have been added to the work as they were made, from time to time, until we now find the art clothed with almost matchless perfection, in the production of the *Carte de Visite* portraits.

The author, desirous of keeping pace with the progress of the art, which is ever onward, has deemed it expedient and necessary to embody in this edition, all the latest and most complete Photographic discoveries of the day.

Accordingly there will be found in this work, not only all the various details of the Photographic process in former editions, but many new and useful ones never before published.

Among the most practical and needed will be

the whole albumen process, as connected with the production of the *Cartes de Visite* and Stereoscopic pictures. Also, the dry collodion process, which has laid so much patient toil and investigation upon the persevering minds of the most eminent Photographers, until now we begin to see the dawn of brighter days in the new tannin process, which promises to complete the great arch of Photography *itself*, and become the keystone of its final triumph.

The stereoscopic pictures have become a permanent feature in Photography. They are now considered as one of the most beautiful, and perhaps wonderful productions of this fascinating art.

The *Cartes de Visite*, which were a consequence of the Stereoscope, and not an original discovery, are soon destined to rival the far-famed Daguerreotype, which indeed they most resemble. Made in their greatest perfection, they are truly the most perfect production of the art at the present day.

Arranged in Photographic Albums, they grace the parlors of all who profess to keep pace with the fashions of the hour, and they have almost become the text-book of our personal friends, as indeed they are when well filled with beautiful specimens of the art.

It is the design of this work to embrace within its pages all the known processes of the most successful operators in the United States; and only such as in practice have been found useful will be adopted.

The steady growth of the art from the first faint image of the Daguerreotype, evolved by its immortal discoverer, has been gradual, step by step, as the art advanced, until we see now the product of the photographer's skill in almost endless variety. The Daguerreotype, first and longest in the field, followed by the Photograph, so-called, on paper, then the Ambrotype, the Stereoscope, and last, but not least in importance, if in proportion, the *Cartes de Visite*, which are destined to keep their place in public favor for many years.

The aim will be to give only such known recipes as have been in actual practice by the author and others, and to explain them in the plainest and most explicit manner possible, in order that the least practised operator may reap benefit from the perusal of the work, as well as those of more mature experience.

The practice of the art of taking Photographs on paper has been attended with very diverse results in the United States, owing in a great degree to

the fact that most persons who have embarked in it have heretofore been Daguerreian artists. They imagined that it only required the necessary skill and experience of a Daguerreian artist to render them good Photographers. But this has been soon found to be a fallacy. There are many who are skilful in the process known as the Daguerreotype, who can produce specimens of that art which would do credit to the profession, who nevertheless utterly fail in this higher branch of Photography. The reason is obvious. They have vainly imagined that only the same care was necessary in the paper process that was demanded in the manipulation of the silver plate. But how soon have their hopes of success been blasted! Where the ordinary care bestowed upon a Daguerreotype would produce satisfactory results, the same care upon a Photograph on paper would produce a worthless picture. Hence we see the necessity of looking into a higher range of art for the perfection of this branch. And as we approach near the goal of perfection in this sublime art, so much the more does it demand of its votaries greater sacrifices on the altar of patience and perseverance, more nearly resembling the long and weary road of the successful painter, who rises in his profession through many

years of patient toil, with his pencil and his pallet, to the highest eminence.

And the day may not be far distant when only those who have been for many long and weary years followers of the Photographic Art, shall become masters of their profession.

It is well, therefore, to fully comprehend the greatness of the task one assumes who embarks in this profession. And to become a perfect master of it, will require all the known resources of his perseverance. Therefore such aids as may be found in the experience of others, will be given here, and it is trusted may be found of essential service to those who may purchase the work and follow the art as a profession.

To the amateurs this work will no doubt be acceptable as a practical treatise, leading them into the more intricate fields of practice not found in scientific works on kindred subjects.

Fortunately for this beautiful art, the number of amateurs is increasing in the United States, and we trust they may continue to augment until the number shall equal those of England and other European countries. For like all beautiful arts, the tempting field of pleasurable labor here opened, is beckoning onwards a host of fellow-laborers, which

will render the task of ultimate success of very easy accomplishment; and it is trusted they will emulate those artists in England who have so willingly opened their stores of knowledge to the photographic world, so that all may reap the benefit of their valued experience.

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CHAPTER XXII.

INTRODUCTION.

CARTES DE VISITE
AND
STEREOSCOPE PICTURES.

The Photographic Art is constantly undergoing changes. The progress is still onward, and we now find the Stereoscope gracing the drawing-rooms of all those who appreciate the art. The *Cartes de Visite* are now the next in the order of progress. They have achieved a name in the world of Photography which will retain its hold for many years. We have therefore devoted all the space to them which their importance demands.

The optical instrument known as the Stereoscope, has for a length of time arrested the attention of the scientific world, not only from the well-known phenomena which it exhibits, but from its actual merits as a work of Art.

There has probably never been an invention so universally entertaining and instructive, which could be procured so cheaply as the Stereoscope.

It is calculated not only to amuse and instruct the little child, but also "children of larger growth" can be and are amused and instructed, by its never-tiring changes of slides, containing views of country, hill, mountain and dale; the frowning precipice, the surging waterfall, and the domestic group. They are not paintings, they are not drawings, they are not sketches; they are really nothing less than a reproduction of the reality, the sensible object prefigured before the eye. Instead of flat surfaces, as in ordinary pictures, the Stereoscope becomes in reality what its name imports, a *solid*, tangible substance.

The eye never tires with seeing, the mind never is weary with viewing, these varied scenes of beauty and interest, and the imagination is led on, step by step, to people all the creations of this wonderful art, with life itself, so vivid are the representations.

It is no longer necessary for one to leave his quiet home and "brave the dangers of the deep," in order to visit the shrines where the tourist most desires to wander, but, seated by his own fireside, he can recall to his wondering gaze all the startling realities of life in the most renowned cities of the world; the various picturesque ruins, the

placid lakes, the romantic cascades, the snow-capped mountains, the modern cathedral, and the relics of the ancient world in the stupendous temples of Egypt. Or he may wander through the classic scenes of Italy or Greece, and press his feet on the sacred ground where the Saviour of the world once trod. Or, in fancy, he may revel amongst the domestic scenes of real life. He may call up vividly before his eyes the scenes of the poet's imaginings, and people with life itself, all the dramatic scenes of the greatest of England's bards. The creations of a sculptor's hand can be presented to him with a distinctness unknown by any other art. In truth, none but real and positive substances are seen in the Stereoscope.

This art has achieved such great success in the few short years since it has been known, that the whole world is now invaded to bring the trophies of its skill, and lay them at the feet of those who desire them. No part of the world is now unrepresented in the Stereoscope.

Stereoscopic views have been made more extensively, and are more generally found to be the most in demand; yet groups of various kinds are being now produced in great numbers, which

are considered as curious, if not so valuable, as views.

The public demand is steadily increasing for these kinds of pictures, and many years will not elapse before a perfect Stereoscopic picture will be considered as indispensable as the works of the great masters. No drawing-room or parlor will be considered complete without a Stereoscope, accompanied with views from the various portions of the world, as well as groups of domestic scenes, &c., &c.

Not only is the realm of nature brought with vivid distinctness to the eye, in the Stereoscope, but contributions from the sciences are brought under its potent charms.

All the sciences are calling in the aid of this great discovery, and we soon shall have a view of all the heavenly bodies, in the Stereoscope. The moon has been made to wheel in its orbit and stand transfixed in the magic view of the Stereoscopic slide.

Fruits and flowers, and all the embellishments which nature has thrown around the world, have contributed their share of glory to this great achievement.

All things visible as well as invisible to the

naked eye, are brought into the magic box, and objects only seen by the microscope are now viewed stereoscopically—if we may be permitted to coin a new word.

Following closely in the train of the Photographic progress, the new style of the Cartes de Visite, or Card Portraits, have become a name in the realm of the Art. And we witness the spectacle of a vast multitude of these beautiful creations adorning the galleries of our distinguished artists. The Cartes de Visite were a consequence of the Stereoscope, not an original conception. They nevertheless show an advance of the arts' progress. They are in reality Stereoscopes, only not viewed in pairs—for every card-picture can be so arranged as to produce the stereoscopic effect, as most of them are taken with two sets of lenses.

Their utility has become a fixed fact, from the great demand which is now made upon the artists for their production; and the public are only satisfied with them in great numbers. They can be multiplied so cheaply, and withal they are so portable, they will no doubt for a long time be in demand.

PHOTOGRAPHY.

CHAPTER I.

HISTORY AND PROGRESS OF THE PHOTOGRAPHIC ART —ITS INTRODUCTION INTO THE UNITED STATES— THE DISCOVERY OR USES OF THE VARIOUS CHEMICALS—POSITIVE PHOTOGRAPHS ON GLASS.

The history and progress of an art so peculiarly distinct from all other arts, demands from its votaries a certain knowledge of its early stages, its introduction to the world, and its authors who brought it into being.

The names of many of those who have been instrumental in perfecting it, are fast passing away, and it seems befitting that, if only as a tribute of respect to their memories, some mention at least should be made of their noble achievements in this field of science—especially their long and wearisome researches and labors in perfecting this wonderful work.

To M. Daguerre, of France, whose name is so

identified with the Photographic Art, from the fact of its being associated with all those impressions on the metallic plate, is the world not only indebted for the first sublime idea, but also the first successful result. Although Mr. Fox Talbot, of England, who was prosecuting experiments at the same time with Daguerre, claims priority of discovery, yet the world would have slumbered in ignorance had not M. Daguerre so clearly demonstrated that light falling upon a certain substance known by chemists as iodide of silver, would impress thereon whatever image was presented for its magic work, and reproduce its own image with all the fidelity of an artist's skill.

The details of M. Daguerre's process, as given to the world in June, 1839, were, of course, very imperfect; yet the principle was thereby established, and has been so successfully carried out by his successors, that he is fully entitled to the credit, and deservedly stands pre-eminent in the ranks as the original discoverer or inventor of this beautiful art.

All the photographic processes since made known and practised, owe their origin, if not directly, at least indirectly, to the fact of his original discovery.

Pictures on paper, glass, &c., are in fact only modifications of his great achievement. They involve a change in the nature of the mere materials used, and do not in any degree affect the original fact that light must be brought to act upon the substance known as iodide of silver to produce the required result.

The researches of Wedgewood and Sir Humphrey Davy, in 1802, are familiar to most scientific readers. These individuals were cognizant of the fact that light acting upon certain salts of silver affected its color. They engaged in these experiments in order to fix the image in the camera obscura at that early day; yet owing to the imperfect state of chemical science, and the fact that iodine itself was not discovered at that time, they finally abandoned it, and left the field for such industrious and worthy investigators as Daguerre and Niepce, who successfully prosecuted their researches, beginning in 1814, and finally announcing their successful result in June, 1839.

The world was astounded to be told that the seeming evanescent image that had flitted so beautifully before the vision of a dreamer's mind in the camera obscura for so many long years, had been caught and impressed indelibly upon a tangible

substance; that the long wished-for aspirations of an artist's soul had been realized; that now it was possible to transform the living pictures which Portia, two hundred years before, had exhibited to the gazing world as wonders of his genius; that they could all be imperishably impressed, and be made to retain their beauty for ages.

Philosophers in science prosecuted their researches, and finally made additional discoveries. We find Sir John Herschel as among the foremost in the ranks. Hunt, Archer, and Mr. Fox Talbot himself, made great progress soon after it was announced that Daguerre had finally perfected his discovery.

Mr. Talbot, however, was unwilling the world itself should profit by his discovery, and he forthwith commissioned agents to all parts of the world to secure patents wherever they could be obtained. With what success he met in their sale may be known from the fact that no one now claims any interest whatever in them.

Mr. Talbot has seen proper of late to withdraw all claims to a patent by his process, and for the reason, no doubt, that it has been so immeasurably superseded by new and more useful improvements.

A patent for any portion of this process is almost

conceded to be a misnomer. Certain it is that one always militates against the successful practice of it; and had M. Daguerre claimed one all over the world, his name would not have attained its present fame.

Mr. Talbot has been very justly censured in England for his long persistency in the claims to his patent. Many litigations were the consequences of it, in all of which Mr. Talbot was not declared the victor, but he always brought upon himself the deserved censure of the photographers in Europe.

M. Daguerre himself, very reluctantly, however, yielded to the wishes of some of his friends, and secured a patent in England, by taking advantage of a peculiarity in the patent laws of that country, yet it has been said he often regretted it.

Wherever any patent has been secured for any peculiar detail of the Photographic Art, it has always tended to bring discredit on its projectors, and render them odious in the eyes of the fraternity, as grasping and over-reaching in their endeavors to gain a few dollars and cents out of this beautiful process, which seems to belong to a higher race of discoveries than most others, partaking almost of the things spiritual.

France awarded M. Daguerre a pension for life, as well as one to M. Niepce, *junior*, the father, who was the original co-laborer with Daguerre, having died in 1833. This pension was small, yet it evinced a noble and generous spirit in the French government, and an example that is worthy of emulation in other countries.

The process on silver plates soon made rapid strides towards perfection, and in a few years we find the art capable of producing specimens of great beauty. The discovery of the use of chloride of iodine, and bromine, and finally the gilding process of Mr. Fizeau, resulted successfully in completing the whole process so perfectly, that few, if any, material improvements have been made since.

This led others to investigate and essay experiments on various substances instead of the silver plate, that being an expensive article; and, moreover, as the daguerreotype could only be seen with distinctness in a certain position, or angle of light, while paper offered such unequal surfaces, a natural desire was expressed to find some other substance to remedy these defects. This first led Sir John Herschel to adopt glass as the readiest means of obviating the difficulties. This was in the year 1844, and he obtained his results by precipitating

iodine and bromine, and chloride of silver upon glass. With this he produced some good negatives, which could be converted into excellent positives.

Herschel describes his process as follows: "The glass plate so prepared receives in the camera a distinct negative image, which appears either in a natural position, or reversed, as you look at it in front or behind. If a solution of hyposulphite of soda is spread cautiously over the surface, and the latter is afterwards rinsed with water, the picture vanishes, but as soon as the plate is dry, it comes again to light, when it looks similar in appearance to a daguerreotype, more especially if it is placed on a dark ground, or blackened over the lamp, whereby, indeed, the negative is made positive."

Here, then, we have the first germ of a positive picture on glass. Herschel himself was searching after a negative picture whereby to produce a positive on paper, nor did it occur to him to pro duce a positive on glass. Had he done so, then the far-famed Ambrotypes, or positive photographs on glass, would have been of an earlier creation than those of 1850 in England.

We see here the actual beginning of this art as far back as 1844.

The next improvement was made by Niepce de St. Victor, of France, in 1848, which consisted in the use of albumen (the white of an egg), containing iodine and a small portion of water. This was used for coating glass plates, and was practised with good success. It was found to possess only a small degree of sensitiveness. Yet it has been since used for taking views, having a further combination of bromine, with excellent results. M. Le Grey, of Paris, was the first to suggest the use of waxed paper. This process, with albumen, gives highly satisfactory pictures, and is only excelled by the use of collodion. It was in 1850 that that substance first was known as the great desideratum of the Photographic Art, and from its discovery and foundation has been laid a superstructure which commands so much admiration in the scientific world.

Had not Professor Schönbein, of Basle, Switzerland, in 1846, made that curious, and at that time almost useless, discovery of gun-cotton, we should have groped our way in darkness in search of a substance that would render all our labors so sure of success.

The use of gun-cotton as an explosive material instead of gunpowder, was by some predicted

when its discovery was first made known; but it was soon found to be useless as an explosive agent, when happily a new element of its nature was developed in the fact of its solubility in ether or alcohol. This produced the substance known as collodion, from a Greek word signifying "to stick." Its similarity to albumen soon caused it to be used instead of that substance, when lo! a servant was obtained for the photographic artist at once so useful and willing that he has ever since, and probably ever will, be subject to his rule.

Collodion was first used in 1850, several claiming the origin of the discovery. Amongst the number may be mentioned Messrs. Archer, Fry, and Diamond, of London, together with Le Grey, of Paris, and De La Motte. The latter asserts that M. Simon, an apothecary of Berlin, suggested its properties to him in the spring of 1850.

CHAPTER II.

THEORY OF THE PHOTOGRAPHIC PROCESS—NEGATIVE AND POSITIVE PICTURES—NEGATIVES ON PAPER AND ON GLASS—POSITIVES ON GLASS—THEORY OF THE POSITIVE AND THE NEGATIVE PROCESS.

The photographic process is one of the latest arts introduced to the world which partakes, in some degree, of the arts of design, and from its nature is really superior, in point of attractive features, to many of the lesser arts. It seems to demand a more elevated range of thought and taste than others, being to a great degree allied to the arts of painting and sculpture. Though in a measure mechanical, yet it possesses many peculiarities which demand from its votaries more than the limited judgment and skill necessary to the perfection of ordinary arts.

The theory of the process is said mainly to consist in that *certain action* to which light is subject of causing its own image or reflection to be ren-

dered apparent by that self-same reflection on sub stances capable of receiving the impression.

The term Photography, or *painting by light*, is sufficiently definite for our purpose, and all we know about the actual theory is, that when certain conditions are observed with regard to light, an impression may be obtained. But what is the real or definite action which takes place upon the surface of the iodized plate, no man has been permitted to know.

Photographs are known either as Negatives or Positives. They are positive in the Daguerreotype and Ambrotype, and negative only in the glass pictures or paper pictures, from which positives are to be taken on paper, and on other similar substances. These terms should be well understood by the operator who seeks success, as they form the basis of all photography.

All pictures taken by the collodion process possess either of the foregoing conditions.

Negatives were first taken on paper, from which positives were produced by the process known as the Calotype, discovered and patented by Mr. Fox Talbot, of England. From the multiplicity of its imperfections, it did not succeed, and no photographs were appreciated by a discerning public

until those negatives taken on glass were produced and positives exhibited from them which were creditable as works of art.

Negatives possess all the various phenomena in their production that are possessed by positives. They are in some respects more difficult to be obtained in great perfection, and in others are less so from their peculiar properties. They are, in fact, only matrixes from which other pictures can be obtained. Therefore they are not perfect pictures of themselves, but only parts of a whole.

The manipulation connected with the negative process is given in this work, with a view to impart all the information with regard to the positive process known in the Art.

The theory of the positive and negative processes is the same, which consists in the reduction of the silver to an oxide on the surface of the glass by the action of light, and the subsequent application of well-known chemical substances. These several conditions must be well observed in order to secure good results. The iodide of silver must be well formed on the surface of the glass. The light given must be only so much as will produce the image, and reveal it after the application of the developing solution, and this must be of just the

requisite strength to produce the reduction from the iodide to the oxide of silver.

The impression is therefore given solely by the action of light, or by certain properties of that mysterious body. Yet when the plate is removed from the camera, there is no apparent change produced, but on applying the developing solution, the sleeping and invisible image awakes and starts into life, and commands from every beholder an expression of wonder and admiration.

Fixing the picture is a subsequent operation, and is no part of the process of production, only so far as it may be necessary to render it permanent, and also to remove the unaffected iodide of silver, a portion of which is not at all changed by the light. Only those parts are affected which are necessary to produce the light and shade.

Positives on glass are taken with chemicals varying slightly from those used in producing negatives, and also by a much shorter exposure in the camera. In fact, a positive is only a negative with a less degree of exposure to the action of light. All positives could of themselves become negatives were the time of exposure prolonged sufficiently to effect that result, though their use as a means of producing subsequent positives on

paper is a matter of doubt, for there are certain other conditions necessary for success in the production of good negatives not known in the positive process.

These positives on glass are now so widely recognized as *Ambrotypes*, that we shall venture to assume that name as one sufficiently significant and appropriate for our purpose.

Ambrotypes are now so well known, that they may almost be said to be identified with the progress of the art in the United States, and belong exclusively to this country. They are not known as such in Europe. They are there classed under the head of Photographs, and the public here are frequently led into error on this point, and suppose, in fact, that Ambrotypes are a new creation —a new kind of picture only known here, while in truth they were first taken in Europe, and are merely photographs on glass, taken positively instead of negatively.

The details of the process, and the necessary manipulations, are of course to be found only in the practical portion of this work.

The whole art consists, therefore, in the careful preparation of the glass plate, in the most scrupulous cleanliness and accuracy of the employment

of every material requisite to the process, and in a most implicit obedience to such rules as are laid down in this work for the guidance of those who would insure success.

The results set forth in these pages were obtained after much patient labor and investigation on the part of a host of intelligent inquirers, who have successfully overcome difficulties which, could they have foreseen, would have appalled the most patient and determined mind. Happily for the photographer who now commences his operations, he may profit by the experience of others, and be spared the labor and investigation of earlier operators.

The path for him is now rid of its most formidable difficulties, and should he be induced to examine carefully the abstruse philosophical principles upon which this fascinating art depends, he may, in his turn, become a contributor to its improvement and advancement.

The experience of the humblest may sometimes furnish a suggestion, which investigations of the most refined and cultivated may have long failed to accomplish.

The art is greatly suggestive. It offers many fields of speculation, and the great aim of all who

practise it should be to perfect it as soon as possible, for, like all the creations of man's genius, it is not yet complete. But the rapid strides it is now making towards long wished-for perfection are so apparent, that we confidently look to the accomplishment of the greatest end sought—namely, the reproduction of the *colors of nature.* This result once obtained, the artist could lay aside his easel and pallet. He could then retire from the arena where he now stands contending so unprofitably, in a pecuniary point of view, with the photographer.

But this seeming triumph of nature over art by the pencillings of the sunlight—the sun himself becoming the universal and sublime artist!—is really the triumph of art over nature; for since art, conscious of the weakness and imperfections of her best efforts, has had the tact and skill to wheel the forces of nature into her own ranks, the result should be set down to her own credit, as her own victory.

PART I.

PRACTICAL DETAILS

OF THE

NEGATIVE PROCESS.

POSITIVE PHOTOGRAPHS ON PAPER.

CHAPTER I.

ON THE PRACTICE OF THE NEGATIVE PROCESS THROUGH ALL ITS DETAILS—THE MANIPULATIONS—CLEANING THE PLATE—COATING WITH COLLODION—DRYING THE SAME—TIME IN THE CAMERA—DEVELOPING—RE-DEVELOPING FOR INTENSITY—VARNISHING THE NEGATIVE—FRAMES OR SHELVES FOR NEGATIVES—GENERAL REMARKS ON THE MANIPULATION OF THE NEGATIVE PROCESS—ARRANGEMENT OF THE LIGHT—USE OF THE CAMERA, ETC., ETC.

There are so many various plans suggested by practical operators in the Photographic Art, all varying so much in detail, that the author has thought proper to simply confine himself to one line of practice, which has been found to produce the best results.

All negative Photographs at the present stage

of the art are taken on glass, and they are called negatives from the fact that all the lights and shades are reversed—*i. e.* where the portrait in life presents the high lights (or where the light falls the strongest, and it should appear the lightest), in the negative it appears the darkest. In like manner, where the dark shades are seen in a positive to be dark as in life, in the negative they are seen light, or to present the high lights. They present these peculiar phenomena only when viewed by transmitted light, or light passing through them, in which position they can only be seen with proper effect. When viewed as a positive, laid on a blackened substance, they resemble in some degree a positive that has been too long exposed in the camera. They cannot be viewed properly in any other manner than by transmitted light.

However, they are never to be sealed up for sale in any form, but are always reserved by the artist to print from, any number of copies that may be desired. And herein consists the great beauty and perfection of this branch of photography. We have the power of multiplying *ad infinitum*, even far greater than if it were printed from an engraving. The negative itself can be reproduced and multiplied so that exact *fac-similes* could be

obtained, and even thousands printed by every negative, so nearly resembling each other, that none could distinguish the first original positive impression.

Regarding the manipulation of negative process as a simple chemical operation, with certain chemical auxiliaries, it is very easy of accomplishment. When once properly understood, if certain rules are observed, it is more sure of success than most others in the art.

The first requisite to success is the cleaning of the glass plate, which is easily done by rubbing it with a piece of cotton-flannel dipped in alcohol, slightly diluted with water; and in case of using the glass the second time, a small quantity of rotten-stone, whiting, or tripoli powder, may be added.

Be careful to dust the glass with a flat camel's-hair brush just before pouring on the collodion. Holding the glass in the left hand, standing near the bath, pour the collodion on with a continuous stream from the bottle until there is enough, which when flowed over the whole surface of the glass will just cover it. Then let the superfluous quantity run off at the right-hand corner into the bottle, slightly moving the glass plate so that the

collodion will not dry in lines or ridges; a quick motion may be necessary to insure a perfect flow of it over the surface. On holding the glass up to transmitted light, it should appear perfectly clear and transparent, as though no collodion was upon its surface—at least, no lines, streaks, or spots. If any are visible, the negative will be faulty.

Let it dry until it appears almost free from moisture; now darken the room; then place it in the bath for one or two minutes, or until the iodide of silver is perfectly formed on its surface, which can easily be ascertained by raising the plate from the bath. If the surface presents a uniform appearance, clear and without any lines or streaks like grease or oil, then it is ready for the camera: a slight motion of the plate will produce this result.

The time of exposure in the camera is entirely a matter of judgment and experience. No definite rules can be laid down; but usually, in a strong light, with the ammonia collodion and the neutral bath, from fifteen seconds to one minute will answer.

The time of exposure can easily be ascertained by a trial-plate.

THE DEVELOPING OF THE NEGATIVE.

This requires great care and much practice, for if the process in all its details is correctly followed, and only a slight variation in the developing of the image, the resulting negative will be of no avail.

As soon as possible after the light has acted upon the plate in the camera, remove it to the developing-stand, or it may be held in the hand, and pour the solution well filtered upon the surface, but only just enough to cover it, retaining all the free nitrate of silver which had adhered to the plate on its removal from the bath. The silver itself acts as a means of darkening the negative.

The developing solution of protosulphite of iron, on page 89, will be found the most useful, and indeed the only one recommended for good negatives. After allowing this solution to remain on the surface for a few seconds, the outlines of the negative will appear. Then, if not sufficiently intense, pour off the developer, and cover it again two or three times, until sufficient intensity is obtained. The negative should gradually appear first in the high light, then the drapery; and, lastly, it should seem to fade partially away.

FIXING THE NEGATIVE.

Always fix the negative in a strong solution of hyposulphite of soda. This will of course remove the iodide of silver slowly, but the collodion is less liable to be attacked by the use of soda than by cyanide of potassium. A saturated solution will remove the iodide of silver more readily, although a less quantity of soda will answer. It is found that whatever quantity is employed, it loses its strength on the immersion of every plate, and must be frequently renewed.

VARNISHING NEGATIVES.

In order to preserve negatives in a proper state for future use, it is well to varnish them. If they are intended only to print a few copies, a varnish of gum-arabic is preferable, not very thick, about the consistency of collodion.

If the negative is required for many prints, the better course would be to varnish with the white negative varnish. All varnishes are poured over the plate in the same manner as collodion, and allowed to dry by being placed on its edge, secure from dust, until it has thoroughly dried.

FRAMES OR SHELVES FOR HOLDING NEGATIVES.

It is very necessary that the negatives should be kept in some secure place; and two shelves, having grooves in them above and below, so that the glasses shall stand on the edges in them, is the best receptacle when not in use. Shelves of various widths, according to the size of the glasses, are required, and with a door that shall close in front of each to exclude the dust, &c.

The manipulation of the negative process is so very important, that certain hints are necessary to insure absolute success.

The arrangement of the light upon the sitter is of vast importance. It should fall with a full force upon the drapery, if it is of a dark color; and the background, which is usually of a somber hue, should also be well lighted up from the skylight. Arrange the subject in a favorable position to produce the most pleasing effect of light and shade upon the face—carefully attending to the pointed light upon the eyes. Avoid the long line of light upon them. If possible, produce a uniform light on the drapery, as that portion is more likely to be clouded than any other.

The position of the camera should demand a

careful study. Some cameras require to be elevated more than others, which can be ascertained by actual experiment. Some will work more uniformly over the whole plate when arranged in an exact line with the face of the sitter.

A skylight which is nearly flat, or one that is slightly elevated only on one side, has been found to produce the most pleasing effects in Photography.

The length of time of exposure of the plate to the action of light is a matter of vast importance, because the intensity of the negative is affected thereby—which will be seen on application of the developing agent. If too long time has been employed, the print will appear flat in details; although the drapery may appear distinct, the roundness will be lost. The middle tints of the face which are so desirable, will not appear. It is better to give a short time first, and bring up the intensity by developing. A short exposure in the camera, if the developing solutions are capable of producing a powerful negative, is found to be the best for strong and vigorous effects. The point to arrive at is to allow just long enough exposure that the developing agent shall just bring out the negative of the required intensity, and no more.

By a trial picture giving what may be supposed nearly the exact time, if too short the augmentation of the next succeeding trials will eventually arrive at the correct result.

It may be proper to mention, that glasses used for negatives do not require to be of such purity as those designed for positives; even good window-glass, which is selected as free from bubbles as possible, will answer a very good purpose. The expense, therefore, for material for Photographic negatives will not be very great, and the artist can retain them for future use after one or two impressions have been taken, so that any future day he may produce more pictures for his patron without any additional sitting.

CHAPTER II.

THE NITRATE OF SILVER BATH FOR NEGATIVES—PREPARATION OF THE SAME—FORMATION OF THE IODIDE OF SILVER FOR THE NITRATE BATH—ON THE PRACTICE OF THE NEGATIVE BATH—OBSERVATIONS ON THE USE OF THE NEGATIVE BATH—ON THE INTENSITY OF THE NEGATIVE—COLOR OF THE NEGATIVE, ETC., ETC.

THE NITRATE OF SILVER BATH FOR NEGATIVES.

The bath of nitrate of silver, which is most commonly in use for negatives, is that known as the nitrate bath. Great care is essential to its proper preparation, and we shall proceed to lay down the precise form to make a bath that will produce the most satisfactory results. The proportion of nitrate of silver required to each ounce of water is usually about fifty grains, though this is not absolutely essential.

All negative baths require a certain degree of working or use before they will act to the best ad-

vantage. They should always be combined with a portion of iodide of silver; and even that should be added again after long use, as many times that simple remedy will remove difficulties which were deemed insurmountable.

Having ascertained the number of ounces the bath contains (see page 50), weigh out the quantity of nitrate of silver necessary to produce, when dissolved, about fifty grains to each ounce of water. Dissolve about one ounce of the nitrate of silver in four or six ounces of water; then dissolve the balance of the nitrate of silver which will be required to fill the bath in the remaining portion of the water.

For every ounce of nitrate of silver which is required in the bath to render it fifty grains to each ounce of water, there must be measured out three grains of iodide of ammonia. This is to be formed into iodide of silver by first dissolving the iodide of ammonia in about two ounces of water, and adding thereto say two fluid drachms of the solution of nitrate of silver, in which one ounce of the silver has been dissolved in four ounces of water. This will immediately throw down a yellow precipitate, which is the iodide of silver. Wash this precipitate three times with water, by filling the

graduate dish or bottle, which should contain at least six ounces of water, and allow it to settle; then pour off the water, leaving the iodide of silver at the bottom. When this is well washed, add it to the ounce of silver previously dissolved in the four ounces of water. Shake it well, then pour the whole into the bottle containing the bath. A milky appearance will be seen in the bath, which is well to remain in that state for a few hours to dissolve as much of the iodide of silver as possible. After filtering the bath until it becomes clear, it is ready for use.

A bath prepared according to the foregoing, if required to be of sixty-four ounces of water, would contain the following proportions:

$64 \times 50 = 3200$ grains, or of nitrate of silver	$6\frac{3}{4}$ ounces.
Iodide of ammonia	20 grains.
Water	2 quarts.

There will be in $6\frac{3}{4}$ ounces of silver, 3240 grains, allowing 480 grains to each ounce. The above quantity will be as near 50 grains to the ounce as will be required for all practical purposes.

Distilled water is preferable in all cases. Though perfectly pure, soft water will answer, if it has not been kept long in wooden vessels. If it has been so kept, it can be first boiled and filtered

through paper, to remove any traces of vegetable matters.

By referring to pp. 133 and 134, and the subsequent pages relating to the preparation of the nitrate of silver bath for Ambrotypes, much valuable information will be found, which can be adopted in the negative bath. The bath will require neutralizing, should any excess of acid accrue in it. The process of neutralizing will be found on page 137.

The negative collodion, which is more frequently used with a perfectly neutral bath, as above described, is that recipe found on page 82.

ON THE PRACTICE OF THE NEGATIVE BATH.

The use of the negative bath requires much care and attention, for herein lies one of the elements of success in the production of perfect negative impressions.

By using the ammonia collodion constantly, the bath is liable to be changed, as it necessarily must be, in its chemical character. Iodide of silver is formed upon each plate, and consequently less silver is contained in the solution, and alcohol is added to the compound from the collodion, as well as a trace of ether. It will soon be found to be

slightly acid in testing with litmus-paper. This acid tendency sometimes is not objectionable; but if there is too much of it, neutralize the bath, and test with a hydrometer to ascertain the strength of silver. Always keep the strength equal to fifty grains to the ounce. In adding more silver to the bath, it may be effected more readily by first dissolving the quantity required in a separate bottle from the one used expressly for the nitrate bath. Filter always before adding to the bath. Always be provided with two bottles, having glass stoppers sufficiently large to hold the contents of the nitrate bath, into one of which it may be filtered.

It is recommended also to add silver often to the bath, if it is in constant use, because if the greater portion of the solution is removed (as some must necessarily be every time a plate is immersed) by adding a large quantity, the whole nature of the bath is changed.

Many operators provide themselves with sufficient solutions for two or three baths. This is a plan highly recommended, as a bath actually improves by age, even if it is not worked every day. Old baths which have been laid aside as useless except for restoration, have, after many days, on a new trial been found to produce good results.

There is a constant change taking place in the nitrate baths, and there are many phenomena connected with them wholly unexplained as yet by the most successful operators. Sometimes an acid bath will work more surely for negatives than a neutral, and sometimes a neutral bath is preferred. The general rule to be observed is, that, if a bath is acid, the time of exposure in the camera is lengthened, and as we approach the neutral point the time is lessened. Therefore to work a bath as nearly neutral as possible, is the most sure of success.

In order that the negatives should produce good positive pictures on paper, they should be very transparent in the dark portions, such as the drapery, &c., and of such intensity in the light parts that a ray of light can with difficulty be transmitted, and this must be combined with a regular gradation in the middle tints.

These desirable results can be attained by using the collodion somewhat thicker for the negatives than for positives or Ambrotypes, as thereby a thicker deposit of silver is obtained on the surface of the glass.

Also a stronger nitrate bath, and using it as nearly neutral as possible, and a longer exposure

in the camera, together with less acid in the developer; all these combined will produce the desired end, viz., an intensity such as will print positives having all the beauty so much desired in good Photographs. The absolute intensity, however, of a negative does not always depend upon the thickness of metallic silver, but to a certain extent upon the color it may have when seen by transmitted light. Negatives also vary in color; some are translucent and of a bronze color, others are of a bluish-black, whilst some are of a gray color. The color most to be sought after is the bluish-black, because these are found to print more uniformly clear in their details.

Sometimes the best negatives are those which may appear to be weak, because the chemical rays are more obstructed, and the print is consequently more uniform in its gradations of light and shade.

The color of the negatives depends on certain conditions of the bath, the time of exposure in the camera, the nature and strength of the developer, and the quantity of acetic acid contained in it. Sometimes the presence of organic matter, which will collect in the bath, may affect the color and tone of the negatives. So that no positive rules can be laid down for the continued action of a

bath; practice alone must be the teacher in this branch of the art.

Seeming uncertainties may appear to some who have not had much experience in the art as obstacles of great moment. But they will all vanish after a short time. These apparent contradictions and perplexities are only met with for any length of time in the experience of those persons who do not attend to the minute details of the art, such as cleaning well the plate, decanting the collodion, the proper length of time of developing the picture, &c. The practice of this beautiful art must not be condemned because it contains a few seeming contradictions; for if it was easily acquired, and always certain of success, there would be no incentive to excellence, and those persons who possessed only a limited taste and experience, could rival the artist in the creations of his genius. It may therefore be deemed a fortunate circumstance to those who would wish to excel, that the road to full success lays through a few rugged passes, and he who would reach the goal of perfect accomplishment must encounter some difficulties.

CHAPTER III.

ON PHOTOGRAPHIC PRINTING—SALTING SOLUTIONS—SALTING THE PAPER—SILVERING THE PAPER WITH AMMONIA NITRATE OF SILVER—PLAIN SILVER SOLUTION—TO PREPARE THE ALBUMEN FOR PAPER POSITIVES—SILVERING ALBUMEN PAPER—ON THE PRACTICE OF PRINTING NEGATIVES—TONING OR FIXING THE PRINT—WASHING THE POSITIVE PRINTS—DRYING THE PICTURES—VARNISHING AND MOUNTING THE PRINTS.

The printing of the Photographs is that portion of the art wherein great care and attention is demanded, and where much of the beauty and finish of the picture is due. The success of it depends upon a perfectly proper understanding of the process.

Having selected the best quality of paper, it may for convenience be cut into sizes such as will be required for use in the printing frames. Though this is not absolutely necessary, the large sheets, as they are manufactured and imported for use, can

first be salted, dried, and laid aside in some secure place, free from dust or fumes of chemicals. When wanted for use, they may be cut of whatever size may be required.

THE SALTING SOLUTIONS.

One quart of pure soft water.

90 grains of hydrochlorate of ammonia, or common sal ammoniac.

(Sal ammoniac is found to be the best preparation of salt, as it contains less impurities than any other known.)

Dissolve and filter.

Place this in a large flat dish, which may be of gutta-percha, earthenware, or porcelain, or even wood, if it is varnished thoroughly with gum-shellac varnish. The dish must be nearly filled, and of sufficient dimensions to admit the whole sheet of paper if laid in it.

The paper is to be immersed one sheet at a time, by laying hold of the sheet at two corners, and it must be drawn quickly through the solution twice, allowing the liquid to wet it as it may on the surface of the paper only, in effect to lay the solution of salt upon its surface without disturbing the fibres of the paper.

Hang each sheet up separately to dry in a room free from dust or any chemical exhalations. The

better plan of suspending paper, either in the salting or silvering process, is to use the patent clothes-pins, which can be arranged on a cord across the room. Great care should be observed in salting the paper to avoid stains, spots, or wrinkles. The hands should never touch any portion of the paper except the corners. The salted papers can be laid aside, and will keep for a great length of time.

SILVERING THE PAPER.

The paper already salted and dried, to be silvered, may be effected by two or three methods.

The ammonia nitrate solution, the preparation of which is described on page 95, is the one mostly in use, and one that will produce, with plain salted paper, the most pleasing results.

The silver solution which may be required for use at one time, is first filtered into a clean bottle, and the paper laid upon a flat surface, covered with paper or card-board, is to be fastened down by the corners with pins or any other article which will cause it to remain stationary. The silver solution is then poured on the middle of the paper, enough to cover it; and with a ball of cotton just newly prepared, carefully spread the silver over

the whole surface, by means of round lines or circles, from the centre of the paper to the circumference. The superfluous silver can be poured into a bottle, but not used again, as it is changed into a chloride of silver, owing to its contact with the salt of the paper. It may be reserved in the bottle, to mix with other silver solutions, that are useless except for the restoration of the pure silver, as described on page 105. The same ball of cotton can be employed to silver all the papers that may be wanted at one time, if it is laid on a clean piece of paper, but a new one will be required for a subsequent preparation.

The silvered papers should be hung up to dry in a dark room, and only enough prepared that may be wanted for immediate use. In the winter season, however, they can be used for two or three days after preparation, if kept carefully excluded from the light, in a portfolio or drawer.

PLAIN SILVER SOLUTION.

This can be used with the prepared chloride of sodium paper, sold by dealers in Photographic materials, and consists of dissolving 2½ ounces of nitrate of silver in twelve ounces of water. This

is also used for silvering the albumen paper, which is prepared as described on page 61.

The chloride of sodium paper and the albumen paper is silvered by laying each sheet separately on the silver solution, contained in a flat dish, and allowing it to float for five minutes, care being observed that no air-bubbles collect under the paper.

The silver solutions must always be filtered through cotton before applying them to the paper. It is only necessary to filter such quantity as may be wanted for immediate use.

The bottles containing the silver solutions should be blackened over with black asphaltum varnish, to exclude the light, and always kept as much as possible in a dark place. Papers may be silvered in a light room, though not where the direct rays of the sun can fall on them.

TO PREPARE THE ALBUMEN PAPER.

Take the whites of three or four fresh eggs, and beat them with a glass rod or flat piece of glass until the article becomes of a frothy consistency. Remove the froth, and place it in a cool place, and allow it to return to its liquid state again, in a long bottle.

Pour off the clear portion of this, and add to

every fluid ounce say from one to four ounces of water, according to the strength of albumen that is required. To each ounce of this fluid of albumen and water, which will readily combine, add fifteen grains of hydrochlorate of ammonia: filter. For salting paper with albumen, it should be floated three or four minutes. Thin paper is generally preferred for the purpose.

SILVERING ALBUMEN PAPER.

Albumen paper must always be silvered with plain silver, of the proportions given on page 59. It must also be floated on the surface of the solution for four or five minutes, never brushed in, as in the ammonia nitrate process.

After using this silver solution with the albumen paper, there will a milky appearance be observed, which can readily be removed by mixing a small quantity of kaolin or china-clay with the silver, and, before using it, filter it clear.

If the proper manipulation is attended to in the use of the albumenized paper, the results will be far more pleasing than by the ammonia nitrate process. The trouble and time required, however, is much greater in the former than in the latter. Therefore the ammonia nitrate is generally

adopted by the profession as more certain in its results.

PRINTING FROM NEGATIVES.

The usual time required to print a picture from a good negative, under the most favorable circumstances, is about four minutes. It is proper to state, however, what are the most favorable circumstances. They are good paper, good silvering solution, and a clear sun-light, with all the necessary details of the practice carefully followed, as in the foregoing directions.

Negatives may be printed with a subdued light, and printed well, as there are many cloudy days when the prints are wanted. Of course, the time of exposure must be prolonged, and even an hour may sometimes be required to produce the necessary depth of color on the paper.

The color which is to be obtained on the print before it is ready to remove from the printing frame, is of considerable importance. The best prints are generally those which are left long enough to assume a depth of shade nearly the intensity that may be wanted when finished and dried, rather darker than the color desired, in order that the time occupied in the toning bath shall

fix the color, to lighten the shades only in a slight degree.

Prints that are too dark on removal from the printing frame, can be rendered sufficiently light by a long action of the toning bath. But such prints will be the more likely to assume a yellow hue, and ultimately fade. The shortest time in the toning bath to produce the desired shade and color is recommended. Therefore prints should not generally be overdone or over-printed when one toning bath is used.

The kind of printing frames recommended are described on page 109.

After the picture is removed from the printing frame, it must be carefully excluded from the light, by placing it in a portfolio or drawer, or where no vapors can reach it. A number of prints may be prepared and laid aside, and all toned or fixed at once.

TONING OR FIXING THE PRINT.

The beautiful tone or color of the prints in their removal from the printing frame, has been a subject of remark by many operators, and various efforts have been made to preserve that most to be desired color, yet it has never been accomplished.

As soon as the fixing solution comes in contact with the paper, a great change takes place, which does indeed arrest the progress of the light, but produces another and entirely diverse change. As the art progresses, some devotee may luckily arrive at the discovery of fixing the exact tone and color seen on its removal from the printing frame.

The first operation of toning the picture is to place it in a bath of clear water, in a dark room, of course, or in a salt solution of two or three ounces of salt to one quart of water. This removes all the chloride of silver not acted upon by the light. They should remain in the salted solution only a short time, say one or two minutes, then place them in a bath of pure water to remove the superfluous salt. This plan of first placing the print in a solution of common salt may be omitted. It may be placed immediately on removal from the frame into the toning bath, or it may be laid in a portfolio, and excluded entirely from the light for several hours, then placed in the toning bath. After which they may be brought out in the light and placed in the toning bath, as found on page 94, and allowed to remain there until the desired color is attained, which will vary according to the strength of the bath and the depth of the print—

generally from ten to thirty minutes for ordinary prints, yet sometimes one or two hours are necessary. They must be carefully watched in the bath, and as soon as sufficient time has elapsed to produce the desired tone, remove them to a bath of clear water.

WASHING POSITIVE PRINTS.

This portion of the photographic process is of great importance, for unless the prints are well washed, so as to remove every trace of hyposulphite of soda, they will invariably fade or turn yellow. Various methods are adopted to remove the hyposulphite, but the plan most likely to insure that result is of course recommended. The longer the prints remain in the water, and the oftener they are changed, will of course more effectually remove the destroying agent. Strange, indeed, that the very substance, hyposulphite of soda, which adds so much beauty to the Photograph, should be the very one to cause its destruction.

The most expeditious method is to place the print on a piece of plate-glass, and allow a stream of water to fall upon it for a few minutes. Then press it between clean white blotting-paper, repeating the operation two or three times. It has

been found that the oftener the water is changed in the washing process, the more beautiful the tones of the prints. Nor should they remain for any great length of time in one vessel of water. The better plan to adopt, when it is possible, is to place the prints in a flat dish or tub, where they will float, and where a constant stream of water is running in, and of course another stream discharging as fast as the supply is given. A very small stream will suffice. By the foregoing arrangements, all those spots and stains so frequently met with will be avoided.

The washing of Photographs may sometimes be completed by placing them in a large vessel of water, and allowing them to remain for several hours. This can only be done after they have been first immersed in several changes of water, say five or ten minutes in each. Still another plan of removing the hyposulphite of soda is highly recommended in the immersion of the prints in warm water. By changing it often with cold water, and allowing it to remain for about an hour in warm water, it will most effectually remove the traces of the soda. Lastly, press each print between two thick pieces of plate-glass, and hang them up to dry.

All these various methods are adopted by the profession, and the successful operator will follow those most convenient of practice, carefully observing, in order to produce excellent results, that the prints shall not remain more than ten minutes in the first or second bath of pure water, because the chemicals which pass into the water, and are so necessary to remove in order to fix the impression permanently, are likely to injure the beauty and tone of the picture.

DRYING, VARNISHING, AND MOUNTING THE PICTURE.

The prints may be hung up in the clothes-pins to dry, but not in the sun. As soon as they are well dried, place them in a portfolio, or between leaves of white paper, and press them under some object, so that they shall not wrinkle. They are then ready for mounting and varnishing.

The varnish for pictures is made as described on page 100, and may be laid on the picture before it is cut in the shape required, or it may be effected after it is on the card-board.

A solution of dextrine, prepared as described on page 104, is the best for holding the print in its place; yet simple gum-arabic will answer if it has

been thoroughly strained and cleared of all particles of dust.

The shape of the print may be made by laying a mat or border over it of any desired size, then marking with a pencil, and afterwards cutting it carefully with the scissors. Or it may be laid on a piece of plate-glass, with the mat laid over it, and cutting it into shape with a sharp penknife.

In pasting the print upon the card-board, great care must be observed that no wrinkles are allowed on the surface, as they will invariably injure the print. After the prints are pasted on the boards, they should be laid under a pressure, so that great smoothness of surface shall be attained. A warm flat-iron is sometimes used with good success, by laying a piece of white paper over each print, and carefully pressing it smooth.

CHAPTER IV.

TO COPY DAGUERREOTYPES AND OTHER PICTURES INTO PHOTOGRAPHS—ON ENLARGING PICTURES—TO ENLARGE PICTURES FROM DAGUERREOTYPES, AMBROTYPES, OR PHOTOGRAPHS—AND TO PRODUCE PHOTOGRAPHS FROM THEM—TO MAKE LIFE-SIZE PHOTOGRAPHS ON PAPER—IRON PHOTOGRAPHS, OR INSTANTANEOUS PRINTING—ON TAKING STEREOSCOPE PICTURES, PHOTOGRAPHIC VIEWS, ETC., ETC.

The copying of Daguerreotypes into other Daguerreotypes, has long been in practice. Latterly they have been successfully copied into Ambrotypes and Photographs. But Photography has gone still further, and life-size pictures are now produced which, when painted by the skilful artist, have rivalled the creations of most painters, both in the correctness and faithfulness of the likeness, which must needs be infallible.

The last great achievement of the Photographic Art, is the production of life-size, full-length por-

traits. This is accomplished by the means of the new solar camera, lately introduced, which bids fair to supersede all other methods of enlarging pictures. Those who may not possess the new solar camera, can adopt the following process, which will be found very useful and practical.

TO ENLARGE PICTURES FROM DAGUERREOTYPES, AMBROTYPES, OR PHOTOGRAPHS—AND TO PRODUCE PHOTOGRAPHS FROM THEM.

The following apparatus will be required for the process, viz.:

One quarter-plate tube, and lens.
One whole-plate camera box.
One or two mirrors to be used as reflectors.
One camera box, capable of holding a glass 14 by 17 inches.

The pictures or portraits more frequently required to be enlarged are the ordinary Daguerreotypes, from the fact that these are the kind of portraiture the longest in use. Many are desirous of obtaining portraits of their deceased friends, life-size, and the demand for that class of pictures is consequently greater than any other.

The plan more easily adopted, is first to take a negative from the Daguerreotype of the ordinary

half or whole plate size, which is effected by the use of a quarter-plate tube on a whole-size camera box. Place the picture to be enlarged, whether it be a Daguerreotype, Ambrotype, or Photograph, in the direct rays of the sun, or by reflecting the sun upon it with a mirror, then bringing the camera box as near the picture as will be required to produce the desired size ; the focus being taken, a negative can easily be obtained by exposure of thirty seconds to a minute and a half. The negative should be as large as possible if on a half-plate, in order that it may be enlarged to life-size by the next operation.

From the print now obtained, which must be first pasted on a card-board, another negative can be produced, either of the cabinet or life size, with the quarter tube attached to the camera box, which must be capable of holding glasses of 11 by 14 inches, and 14 by 17. Place the pictures in the direct rays of the sun, or use a reflector as before, and any size may be taken, up to the size of life,—showing, of course, only the head and shoulders.

The print from this negative will not be so distinct in the outline as though it was taken from life ; yet it will retain all the outline and sufficient of the details for all purposes of painting, and it

may be printed either upon paper or canvas with the same facility as ordinary Photographic printing.

In order to insure a more perfect negative, it may sometimes become necessary to use more than one mirror as a reflector of the sun's rays upon the surface of the picture. The more powerful the reflection the more distinct will be the negative. The re-developing with bi-chloride of mercury, as given on page 92, is highly recommended in this process.

A negative may be taken without the direct rays of the sun from any picture; but, in enlarging, the powerful light of the sun is deemed almost indispensable, as it greatly facilitates the process, and renders the time required much shorter, and secures a more intense and definite negative.

Should the Daguerreotype be an imperfect one, as is frequently the case, of course all the imperfections will be magnified, yet they can be entirely removed by the skill of the painter.

The usual time required for taking the negative, life-size, will vary from a minute to ten minutes. In consequence of the large size and the long distance of the ground glass from the lenses, the time of exposure in the camera is greatly augmented.

IRON PHOTOGRAPHS, OR INSTANTANEOUS PRINTING OF NEGATIVES WITH A DEVELOPER.

A process has lately been introduced for printing negatives, with the use of a preparation of iron: hence the name Iron Photographs. This process, however, is a revival of an old one. It will be found very useful on many occasions, when expedition is required, as a negative may be taken and the positive picture printed, washed, toned, and dried in the same time as an ordinary Ambrotype. The process is as follows:

Water	1 pint.
Citric acid	1 ounce.
Ammonia citrate of iron . . .	½ ounce.
Concentrated ammonia . . .	1 ounce.

Mix these ingredients, and filter, and keep in a glass-stoppered bottle, excluded from the light of day.

Apply this solution with a flat camel's-hair brush on one side only of the photographic paper, carefully laying it on even by brushing it in both directions. Then hang it up to dry in a dark room. When dry, it may be cut into suitable sizes for printing, and kept in a portfolio. The paper will assume a yellow color. Print with the ordinary

printing frames, but only for a short time, until the faint outlines appear. Remove from the printing frame, and apply the developing solution either by immersing in a flat dish, or pouring it on the paper after laying it upon glass.

THE DEVELOPING SOLUTION.

Nitrate of silver	½ ounce.
Water	1 pint.
Aqua ammonia	¼ ounce.

Filter the solution, and use over again.

THE TONING BATH.

Hyposulphite of soda	1 ounce.
Water	1 pint.
Nitro-muriatic acid	10 drops.

Wash the print well after developing, and place it in this toning bath for a short time, and the color will be changed from the deep reddish hue that it has assumed by the developer, to a purple color.

The print must now be washed quickly in three or four waters, and placed between sheets of blotting-paper, and dried by the spirit-lamp. Should the tone not be desirable, a modification of the toning bath may be made by changing the proportions of hyposulphite and the addition of chloride of gold. The tone may be improved sometimes by

exposure of the print for a few seconds to the direct rays of the sun. The addition of a saturated solution of gallic acid to the developer, in small quantities, will change the tone; but it cannot be used over again. Therefore only mix enough for each print as it may be required for use.

The sepia tone may be given these prints by omitting the hyposulphite bath entirely, merely washing them in water thoroughly after developing, but they will be more liable to fade.

Photographs by this new process may be printed from a weak negative, and even an ambrotype impression will answer. The tone of the prints will not be equal to those printed by the old process; but sometimes expedition may be required, and Photographs can be taken and finished as soon as Daguerreotypes or Ambrotypes.

THE STEREOSCOPE.

Stereoscope pictures are considered by some operators as the most valued of the productions of the Photographic Art. If they are properly executed, they are indeed the most curious and instructive of any branch of Photography, though they have not received that attention in this country which they have merited,—mainly, however,

from the fact that few operators have devoted much attention to their production. The most pleasing are Photograph views.

The stereoscope is an instrument invented by Prof. Wheatstone, for combining two slightly dissimilar images, so that out of two flat pictures *one* apparently real or solid object is produced—having all the projections, concavatures, and other peculiarities of the object itself, and standing out in all the strength and solidity of an actual tangible object.

The reason why two flat images should produce the effect of solidity, and a slight consideration of the best means of producing these flat pictures, so that they shall produce in the most proper manner this extraordinary result, will now be given.

Ordinary vision may be considered under the two heads of Monocular, or vision by one eye, and Binocular, or vision by two eyes. If we look through a telescope, microscope, or single opera-glass, or close one eye, we have monocular vision; and by using two eyes, or spectacles, or double opera-glasses, we have binocular vision.

Let us first consider monocular vision. If we close one eye and look at objects, we perceive them by their forms, sizes, colors, and gradations of light

and shade; and reason and experience tell us that these appearances vary as the objects are near or distant from us. We find that as objects recede they become smaller, apparently, in size, and this decrease in size is according to fixed laws, upon which perspective is based. We also observe that light and shade are less marked, the colors less brilliant, the details less clear, and the whole of the objects less distinct; and according to these changes do we estimate relative distances. Upon this principle the artist, in his landscape, paints his distant objects small, vague, and indistinct, while the foreground is brought out strongly with abundance of detail; and in proportion as this is done skilfully, we admire it as an imitation of nature. There is, also, another means of judging of distance. The eye, like other optical instruments, has constantly to change its focus, according to distances to which it is directed, and this change of focus is another means of estimating distance.

Stereoscopic pictures may be taken either with one or two cameras. If the object be still-life, a statue, or edifice, then one camera will do better than two, for you may set the camera at any point and work away until you produce a satisfactory impression. Having obtained that, move the

camera to the other point of view, and again work until you have achieved your object. But if you should have a picture of living objects to take, it is very desirable to produce the *two* pictures simultaneously by two cameras; for taking a view of a street, for instance, where figures are accidentally introduced, you might have them in one picture and not in the other, or misplaced, unless you obtained both pictures at the same time. But for portraits, though it is desirable to take both impressions at once, it is not necessary. And now comes the important inquiry, how far removed should the cameras be from each other in order to produce the best effect? or, in other words, how wide should the stereoscopic angle be? This is a question often put, but not so easily answered. Strictly speaking, the natural standard may easily be cited, and an answer based on it be given. The eyes are $2\frac{1}{2}$ inches apart, and as each camera is to represent an eye, the centres of the two lenses should never be more than that separated. This is the strict theoretical doctrine laid down by Sir D. Brewster, nevertheless it is very seldom adopted in practice. It has been stated, that the more dissimilar the two stereoscopic images are, the greater the relief. Now, dissimilarity of image is obtained

by widening the distance between the two cameras, and the greater the width or angle the greater the relief. As the stereoscope is chiefly valued for the production of this relief, the generality of stereoscopic pictures have been and are taken at too wide an angle, so that *monstrous* instead of natural relief is the result. If two pictures are taken at the same angle, no relief is obtained but that which is due to the magnifying power of the lenses. Increase the angle a little, and still greater relief is produced; increase the angle still more, and so on until you have passed the angle that produces natural relief, and reached that which produces monstrosity.

Nearly all stereoscopes will have more or less of imperfection in the detail, owing to the fact that no two pair of eyes view the same pictures in the same focus. Hence we find some persons who cannot see the stereoscope pictures at all.

PHOTOGRAPH VIEWS.

Views by the Photographic process are attracting the attention of the artists in this country, and deservedly so. They are easily taken, because an ample supply of light is always obtained. The only objection is the necessity of transporting the

various solutions to the localities where the view is to be taken. This difficulty is overcome by the new dry processes which have been published lately. The albumen process on paper, page 61, is highly recommended for views, as the tone of those pictures is more appropriate for this style of Photographs.

It is not necessary here to enter into the details of the processes. Suffice it to say, that the same collodions are to be used, and the same developers, as in the process for taking portraits. The lenses of the ordinary camera, however, must be changed to convert it into a view camera. It is done simply by removing entirely the set of lenses in the rear of the tube, and placing the front lens in their stead, and reversing them. It will also be necessary to put a diaphragm, with a very small opening, in front of the tube, or near the location of the front lens. The time of exposure required in the camera with a small diaphragm, will necessarily be somewhat extended in order to produce vigorous negatives. The use of the diaphragm is absolutely necessary in order to correct the perspective of near and distant objects. Also to cut off a portion of the diffused light, which would otherwise injure the negative.

CHAPTER V.

ON THE PREPARATION OF NEGATIVE COLLODIONS—THE FORMULÆ FOR NEGATIVE COLLODIONS—MIXING VARIOUS COLLODIONS—DISSOLVING THE IODIDES—DOUBLE IODIDE COLLODIONS—THE CELEBRATED GERMAN PROCESS COMPLETE—THE NEGATIVE DEVELOPING SOLUTIONS — RE-DEVELOPING PROCESS — BICHLORIDE OF MERCURY AS A RE-DEVELOPER—FIXING SOLUTION—THE TONING BATHS—THE AMMONIA NITRATE OF SILVER SOLUTION.

This chapter will be devoted to careful and detailed formulæ for the preparation of the negative collodions, the developing solutions, and including all the various receipts necessary to be well understood in the practice of the Photographic Art.

Indeed, this chapter will assume one most entirely of reference, and, as will be seen, it must frequently require mention in other portions of this work.

NEGATIVE COLLODIONS.

For the preparation of negative collodions, we shall only give the proportions. The manner of dissolving the sensitive chemicals will generally be left to the judgment and experience of the operator.

THE AMMONIA COLLODION.

No. 1.	Plain collodion . . .	1 ounce.
	Iodide of ammonia . . .	6 grains.
	Bromide of ammonia . .	3 grains.

With the nitrate of silver bath neutral, and of a strength of 50 grains of silver to each ounce of water.

CADMIUM COLLODION.

No. 2.	Plain collodion . . .	1 ounce.
	Iodide of cadmium . .	7 grains.
	Bromide of cadmium . .	3 grains.

Nitrate bath 50 grains to the ounce.

This collodion is greatly in use in warm climates.

No. 3.	Plain collodion . . .	1 ounce.
	Iodide of potassium . .	8 grains.
	Bromide of ammonia . .	3 grains

Bath of 40 grains to the ounce.

This collodion is highly recommended for negatives when combined equally with the ammonia

collodion No. 1. It will be found to work in some baths when no other collodion will succeed. It may be used also for Ambrotypes.

The practice of the most successful operators has taught them that the mixing of two collodions of diverse proportions, and made of different chemicals, will be found the most useful, and work with more certainty. The author himself would, therefore, enjoin this hint upon those who may practice from the foregoing formulæ.

THE COMPOUND CADMIUM COLLODION.

No. 4.	Plain collodion . . .	1 ounce.
	Iodide of cadmium . .	6 grains.
	Bromide of cadmium . .	3 grains.
	Iodide of potassium . .	5 grains.
	Tincture of iodine . . .	5 drops.

Nitrate bath of 50 grains to the ounce. The bath to be iodized with iodide of cadmium.

Dissolve the iodide of potassium in water, and the cadmium in alcohol.

The foregoing collodion is the one highly recommended for use, especially in warm latitudes. It is the most durable, and it improves by age, retaining its working qualities for several months. The author has adopted the cadmium collodion, in many instances with great success, especially when

it is combined in equal parts with the ammonia collodion No. 1.

To unite the sensitive ingredients with all collodions, it is recommended to dissolve them first in a small quantity of alcohol when they are soluble in that substance, and only use water when they will not otherwise dissolve. Always dissolve the bromides first, and add the iodides to the same solution. The iodide of ammonia and bromide of ammonia will dissolve in alcohol if a small quantity of water is added. Iodide and bromide of cadmium will dissolve readily in alcohol alone.

A DOUBLE-IODIZED COLLODION.

The following formula is compounded in a different manner from any other, and is one that is highly recommended. Prepare two bottles of collodion separately, as follows:

No. 1.	Plain collodion . .	1 ounce.	
	Bromide of potassium .	5 grains.	Dissolved
	Iodide of potassium. .	8 grains.	in water.
No. 2.	Plain collodion . .		
	Iodide of ammonia .	5 grains.	Dissolved
	Iodide of cadmium .	3 grains.	in water.

No. 1 will produce clear negatives, and perhaps rather weak. No. 2 will produce one very intense.

But mix these two collodions in equal proportions after they have well settled, and the most perfect half-tints are obtained. Should it be desirable to produce a negative of more intensity, use a larger proportion of No. 2. In like manner, if a mixture of equal proportions produces too much intensity, then increase the quantity of No. 1.

It will be found on using the two collodions above, separately, that as one will produce a weak negative, and the other a deep one, they can be so modified by uniting them in the proper proportions, that any degree of intensity may be obtained.

THE GERMAN PROCESS.

The following method of preparing negative collodion has been found to be very excellent in its results, and is known as the German process, so modified and rendered practical that any operator can work it successfully.

The plain collodion is to be made with 10 ounces of ether and 5 of alcohol, rendered of the requisite consistency by the addition of gun-cotton.

TO SENSITIZE THE COLLODION.

Nitrate of silver dissolved in water .	50 grains.
Iodide of ammonia dissolved in water	40 grains.

Mix the two solutions, and wash the precipitate

in several waters; lastly, wash in alcohol. Then make the following compound:

Alcohol at 95° . . .	2 fluid ounces.
Iodide of ammonia . .	100 grains.
Bromide of ammonia . .	40 grains.

When dissolved, add the iodide of silver, and agitate the whole for several minutes; then filter through common filtering-paper, and add the liquid to 20 ounces plain collodion; agitate the collodion for a short time, and add to it as follows:

Fluoride of ammonia . . .	40 drops.
Tincture of iodine	10 drops.

This iodized collodion may be used in 12 hours, but is much improved by standing 3 or 4 days. The tincture of iodine used in the collodion is simply a saturated solution of alcohol at 95°, with pure crystals of iodine.

NITRATE BATH.

Distilled water	56 fluid oz.
Nitrate of silver . . .	$4\frac{1}{2}$ oz. by weight.
Dissolve the silver in 8 oz. of the	56 oz. of water.
Then add iodide of ammonia .	10 grains.
White sugar or rock-candy .	120 grains.

When dissolved, add the remainder of the water, and in this condition let the bath stand 12 hours;

then filter through common filtering-paper, add 30 drops glacial acetic acid, and it is fit for use.

DEVELOPING SOLUTION FOR NEGATIVES.

Pure soft water	16 ounces.
Sulphate of iron	1 ounce.
Alcohol at 95°	1 ounce.
Acetic acid, No. 8	2 ounces.

First dissolve the iron, then add the remaining properties, and when filtered it is ready for use.

FIXING SOLUTION.

This is simply any quantity of water saturated with hyposulphite of soda.

RE-DEVELOPING.

The negative is re-developed after it has been cleared up. Make a saturated solution of gallic acid in distilled water 1 ounce, then add 30 drops of the following solution :

Distilled water	1 ounce.
Nitrate of silver	35 grains.

When this solution is filtered, it may be used as follows :—After the negative has been fixed and washed, pour on it of the re-developing solution a quantity sufficient to cover the plate, and keep it

on until the required intensity is obtained, then wash with water and dry. In developing and re-developing, the solutions must be kept gently and constantly moving on the plate; for if allowed to stand still, or to remain for any length of time on one portion of the plate more than on other parts, the plate is liable to lines or streaks.

This re-developing process is not recommended, and if the collodion and bath are properly made, need never be adopted except it may be in dark weather, or when a child's likeness is taken. For it will always be found that the resulting negative is never so well adapted for printing. Therefore, as soon as one finds that he cannot procure negatives sufficiently intense in an ordinary exposure without re-developing, he may be assured there is some portion of his chemicals at fault. The first opportunity should be embraced to remedy the difficulty: first, by changing the nature of the nitrate bath, then the collodion and developing agent.

THE NEGATIVE DEVELOPING SOLUTIONS.

The developing solutions which are required for the negative pictures are not very numerous. The one mostly in use is composed of protosulphite of

iron and acetic acid. With this alone, and the various modifications, all the different varieties of negatives are produced in this country. In Europe the developing solutions mostly in use are composed of pyrogallic acid.

The developing process must be thoroughly understood before good results can be obtained. And, first, the nature of the collodion and the nitrate bath must be known in order to form the developer so as to produce the best results with that combination. The following formula will be the best adapted for working the neutral bath of 50 grains to the ounce, with the ammonia or cadmium collodion, as prepared on page 82.

Protosulphite of iron . . .	2 ounces.
Water	1 quart.
Acetic acid, No. 8	6 ounces.

The iron is first dissolved in the water and filtered, and the acetic acid is added in the above proportions, but only as it may be required for use. It will not develop properly if mixed and allowed to remain for several hours. It may sometimes require a small quantity of alcohol to cause the solution to flow evenly over the plate. But the addition of the alcohol lessens the intensity of the picture, therefore it is best to avoid its introduction

as much as possible. Indeed, its use has been abandoned by good operators.

By increasing the quantity of iron, the developing process proceeds more rapidly, and by lessening the quantity of acetic acid it is modified.

In order, therefore, to ascertain the requisite quantity of each ingredient that may be necessary for the particular combinations of collodions and baths, it will be proper to vary the proportions of iron and acetic acid. By a few changes in the proportions, and a few trials, nearly all varieties of collodion may be made to produce a good negative, if the bath is of the requisite strength and all other due proportions are observed.

There will, however, be found another formula for re-developing negatives on page 91, which is given in addition to the foregoing mainly with a view to enable any person to obtain an intense negative, even if their chemicals are not properly combined.

RE-DEVELOPING PROCESS.

Frequently the negatives, after being developed by the foregoing solutions, will not assume that degree of intensity that is desired. They may still

be made more intense by continuing the process of developing in the following manner:

Prepare two solutions as follows, viz.:

No. 1.	Water	8 ounces.
	Protosulphite of iron . .	2 ounces.

Dissolve the iron and filter.

The second solution is as follows:

No. 2.	Nitrate of silver . . .	$\frac{1}{4}$ ounce.
	Water	8 ounces.

The re-developing is attended with some difficulty, as there is great danger in producing lines or streaks on the negative.

The following cautions must be observed:—After the first process of developing, wash carefully with a large quantity of water, still keeping the plate in the dark room upon the levelling-stand, or in the hand, and pour over its surface enough of the solution No. 1 to nearly cover it; then quickly pour enough of No. 2 to mix with it upon the plate, which must have a little motion in order to flow over the whole plate as quickly as possible. It will be seen that no perceptible action takes place on the application of the iron solution; but as soon as the silver is added, a quick and energetic action commences, and the intensity is increased to any

desired depth. Great care must be observed not to continue this process too far, as the negative will become too intense, and full of lines and streaks. As soon as sufficient intensity is produced, wash quickly with water all traces of the developer.

BICHLORIDE OF MERCURY AS A RE-DEVELOPER.

Make a saturated solution of bichloride of mercury, and always have it in readiness in a glass-stoppered bottle.

This can be used with great success in copying Daguerreotypes or Ambrotypes into negatives. The solution must be reduced considerably from the full strength of the saturated solution, but only the quantity required for use. The exact amount of dilution will depend upon the strength of the negative after it is developed by the protosulphite of iron developer. The plate is first developed in the usual manner as soon as it is removed from the camera, then carefully washed, and, before the light has fallen upon it, a weak solution of the bichloride of mercury is poured quickly over it. It will assume a deeper intensity immediately; and when sufficiently so, it is to be washed and fixed in the hyposulphite in the usual manner. All

negatives, rendered intense by the application of bichloride of mercury, will assume a deep bluish-black color, which can be modified by changing the strength of this re-developing agent.

FIXING SOLUTION.

This is always a saturated solution of hyposulphite of soda.

The plate is to be thoroughly washed with water after developing, and laid carefully in a flat dish containing the hyposulphite of soda; and as soon as the iodide of silver is dissolved from the surface, which may be known by its becoming clear from that milky appearance, it must then be immediately washed entirely free from the least traces of soda.

Then dried—or it may be varnished before drying, with a solution of gum-arabic, of the consistency of collodion which has been strained. Of course, the gum-arabic is to be poured over the surface in the same manner as collodion.

TONING BATHS.

The most useful and practical toning bath for paper, prepared with the ammonia nitrate of silver solution, is composed as follows:

Water	1 quart.
Nitrate of silver	60 grains.
Chloride of gold	60 grains.
Or four bottles of the ordinary chloride of gold.	
Hyposulphite of soda	2 ounces.

In preparing the foregoing bath, the following method should be adopted to insure the most complete success.

Dissolve the hyposulphite of soda in about four or six ounces of the water taken from the quart, and the chloride of gold in about four ounces of water, in separate bottles. Convert the 60 grains of nitrate of silver into the chloride of silver, by dissolving it first in three or four ounces of water, to which add 60 grains of common salt. Wash the precipitate in water three or four times, then pour off all the water, leaving the white precipitate, which is the pure chloride of silver. Now pour this solution of chloride of silver and hyposulphite into the remaining portion of the water, and add the chloride of gold in solution to it. It will assume at first a wine color, and may appear of a darker hue in a few moments. It is now ready to receive the printed picture from the printing frame, or it may be first immersed in salt and water, as described on page 64.

This toning bath is intended only for paper salted

in the manner described on page 57, and silvered with the ammonia nitrate of silver solution, as described below. When not in use, it should be kept from the light in a glass-stoppered bottle. This bath, when once prepared in the foregoing manner, will improve by age and use, for the immersion of every print tends to increase the quantity of chloride of silver. A bottle of chloride of gold must be added occasionally, dissolved in six or eight ounces of water.

PREPARATION OF THE AMMONIA NITRATE OF SILVER SOLUTION.

Nitrate of silver	2 ounces.
Distilled water	1 pint.

Dissolve the silver in the pint of water, and pour out about two ounces into a separate bottle for future use.

Now add of strong concentrated aqua ammonia, a few drops at a time, to the fourteen ounces solution of silver and water. A dark brown precipitate is formed at first, which must be stirred with a glass rod, or, if in a bottle, it may be shaken. Continue to add more of the aqua ammonia, and stir the solution until it remains perfectly clear. Then add the two ounces which were reserved for

use, as referred to above. This will cause the solution to be slightly turbid, which can be filtered perfectly clear, and it is then ready for use. This preparation must be kept entirely excluded from the light of day.

This solution must be filtered, and only in sufficient quantity for immediate use.

CHAPTER VI.

DETAILS OF THE VARIOUS RECIPES IN THE PHOTOGRAPHIC PROCESS—QUICK METHOD OF SILVERING AND PRINTING PAPER—BEST METHOD OF SALTING PAPER—TEST FOR GOOD COLLODION OR GUN-COTTON—VARNISH FOR POSITIVES ON PAPER—INSTANTANEOUS PRINTING PROCESS—NEW METHOD OF VARNISHING POSITIVES—TO RESTORE PRINTS THAT HAVE CHANGED COLOR—CLEANING GLASS PLATES—TO VARNISH NEGATIVES—DEXTRINE PASTE FOR MOUNTING PHOTOGRAPHS—GUM-ARABIC AND GELATINE—TO RESTORE SILVER FROM OLD SOLUTIONS—TO REMOVE WATER FROM COLLODION, AND TO PURIFY IT—TEST OF HYPOSULPHITE OF SILVER IN POSITIVE PRINTS—PRINTING VARIOUS BACKGROUNDS.

This chapter will be devoted to the variety of practice in the Photographic Art. Many recipes will be given of the various forms of operating. Many will be found useful, and it is trusted that none will omit to note down the variety here be-

cause they number so many. These must necessarily be given promiscuously, from the fact that no process here written has any peculiar relation to another.

AN EXPEDITIOUS METHOD OF SILVERING PAPER AND PRINTING THE SAME.

Employ the ammonia nitrate of silver, the usual strength, and fasten the paper already salted upon a flat piece of board, by means of a pin or small nail, at each corner. Then, with a ball of clean cotton dipped in a solution of silver just filtered, and placed in an open flat dish, carefully rub the paper in all directions. Then dry it quickly by a fire in the usual daylight. As soon as it is dry, place it immediately in the printing frame, and expose to the sun's rays. This will insure a picture with very little delay; and if proper care has been observed in the operation, very excellent results may be obtained. Many successful artists have adopted the foregoing process with marked success.

THE BEST METHOD OF SALTING PHOTOGRAPHIC PAPER.

Always use the hydrochlorate of ammonia (sal ammoniac) in salting paper, and never over 90

grains to the quart of water. A larger quantity impairs the tone.

This preparation of sodium has been found to produce the best results, from the fact that it is in a purer state than any other known forms of salt. Hence it should take the preference of all others in the salting process.

The addition of gelatine to the salting solution is strongly recommended, say about one grain to every ounce of water. The gelatine should be of the purest quality, and it should first be dissolved in warm water, and added to the salting solution, which itself must be warmed if in the winter season.

Always filter the salting solution, so as to avoid any spots of dust or foreign substances that may collect in the dish.

TEST FOR GOOD COLLODION OR GUN-COTTON.

There is a sure test, and one that it is well to remember and apply, in making collodion. After the gun-cotton is well dissolved in the ether and alcohol, and of the requisite thickness, pour a small quantity of the plain collodion on a piece of glass, allowing it to drain off in the same manner as in coating the plate with sensitized collodion.

If the glass appears perfectly clear and transparent after it is dried and held up to transmitted light, it may be used for working collodion; but if there should appear any milkiness or opacity on the surface of the glass, there is a fault of the gun-cotton or the alcohol or ether. Unless a perfect, clear, and transparent film is obtained, the collodion, when properly sensitized, will not furnish good results. The addition of a small quantity of alcohol will sometimes remedy the defect.

VARNISH FOR POSITIVE PHOTOGRAPHS ON PAPER.

The best varnish for paper pictures is undoubtedly gum-arabic and gelatine.

The gum-arabic must be allowed to dissolve thoroughly, then with warm water dissolve the gelatine, using only a small quantity. The proportions are as follows:

Gum-arabic dissolved, and about the consistency of collodion	1 ounce.
Gelatine	2 drachms.

Dissolve and filter through a cloth every time before using. To be laid on with a flat brush made of hogs' bristles.

INSTANTANEOUS PRINTING PROCESS.

In dark, cloudy weather, or in winter, it is sometimes desirable to print positives, and the following method will be found to be useful, as pictures can be produced in the least portion of daylight. It is as follows :—Float the papers each for five minutes in a solution of bichloride of mercury, prepared as follows :

Saturated solution of bichloride of mercury	6 drachms.
Water	1 pint.

Silver it in a plain silver solution, 40 grains to the ounce of water. But it must be so done in a dark room, and the lamp carefully screened by means of a yellow glass. Expose only for about two to ten seconds in summer, and not more than a minute in winter, and then in a very subdued light. Of course the paper must be placed in the printing frame in a darkened room, and the frame itself carefully excluded from the light during the operation, except the time required to make the impression. Remove the picture still in the dark room, when it will appear very feeble, but it is seen to be developed by means of a solution of sulphate of iron, as follows :

Sulphate of iron	½ ounce.
Water	1 pint.
Glacial acetic acid	¼ ounce.

Develop until the picture is of the required depth of color, then wash, and immediately fix with hyposulphite of soda; and finally, carefully wash, as in the ordinary process.

NEW METHOD OF VARNISHING POSITIVE PHOTOGRAPHS ON PAPER.

Dissolve by a slow heat two ounces of white wax and add two ounces of common Venice turpentine, and stir the mixture well. This, when cool, will be of the consistency of paste. After the Photographs are dried, spread this paste evenly over the surface with a brush, and rub it with a piece of woollen flannel; hang it up to dry in a warm room for six or twelve hours. The smell of the turpentine soon leaves the print, and when dry it may be rubbed hard with dry flannel until a fine polish is obtained. This process of varnishing Photographs not only greatly improves them, but also preserves them from liability to fade.

TO RESTORE PRINTS THAT HAVE CHANGED COLOR.

Wash the print well, and immerse it in a solution prepared as follows:

Water	1 quart.
Saturated solution of the bichloride of mercury in muriatic acid . . .	20 drops.

Remove the picture as soon as the desired purple tone is attained, then carefully wash it in several waters, and dry. Prints that are greatly faded may be restored by this process equal to new.

CLEANING GLASS PLATES.

Some operators experience much difficulty in cleaning the glass plates for negatives. It is a matter which to some is no difficulty, and therefore not much attention is paid to it by those who work successfully. In order to feel perfectly sure that the plates are cleaned, they may be first immersed in a solution composed as follows:

Water	1 pint.
Cyanide of potassium .	$\frac{1}{4}$ ounce or 120 grains.
Carbonate of potassium .	240 grains.

By placing all new glasses in this solution for a few minutes all traces of grease or fatty substances are removed. They can then be washed, dried, and cleaned with alcohol in the usual manner. Glasses that have been used may be more readily cleaned by first laying them in water in order to remove the collodion. Then immerse them in

the foregoing solution, wash, dry, and clean as usual.

TO VARNISH NEGATIVES.

Negatives may be varnished with the common white negative varnish, or the diamond varnish, sold by all the dealers in photographic materials.

DEXTRINE PASTE FOR MOUNTING PHOTOGRAPHS.

The article known as dextrine is the best in use for pasting Photographs on card-board, from the fact that it is not so liable to cause them to fade. It is made simply by mixing a sufficient quantity of ground dextrine in hot water to render it of the consistency of ordinary paste. Then apply with a brush.

GUM-ARABIC AND GELATINE.

Gum-arabic	8 ounces.
Gelatine	$\frac{1}{4}$ ounce.

Mix and dissolve in hot water, and strain through a cloth before using. This is useful for varnishing the Photograph after it is pasted on the card-board.

By the addition of a little sugar to the above, a paste is formed which may be used for pasting the Photographs on the card-board instead of the dextrine.

TO SEPARATE SILVER FROM OLD COLLODION SILVER BATHS,

FROM THE NITRATE OF SILVER SOLUTION, USED IN PREPARING POSITIVE PAPER, AND FROM THE WATER THAT HAS BEEN USED TO WASH THE PRINTS BEFORE THE IMMERSION IN THE CHLORIDE OF GOLD, ETC.

To the liquid containing the silver add a solution of common salt, until no milkiness is perceptible. This will precipitate the silver in the state of a chloride.

After shaking well, allow this chloride of silver to settle, when the liquid should be poured away, and the precipitate washed several times in clean water. The larger part of the water should now be poured off, and a piece of clean zinc put into the bottle, to which add a few drachms of sulphuric acid. The mixture will immediately effervesce. The zinc is dissolved in a short time, and the chloride of silver will be transformed into metallic silver, in the state of a black powder.

There should be an excess of zinc in the liquid, in order to effect the transformation of all the chloride of silver into metallic silver. This change of the chloride to the metallic state, commences first with that which is in contact with the zinc, which

becomes immediately black. It must now stand without shaking, until all the chloride of silver has become uniformly black, when the remaining zinc should be taken out, the liquid poured off, and the silver washed two or three times with water acidulated with sulphuric acid, and finally with clean water.

The silver can be separated from the water by filtering through paper, and is pure. It can be used to prepare nitrate of silver.

TO REMOVE WATER FROM COLLODIONS, AND TO PURIFY OLD COLLODIONS.

A very simple method of removing water which may be found in collodion, is to add a quantity of common saleratus well dried—shake it well and allow it to settle: it will not only remove the water, but greatly improve the quality of the collodion. Many old collodions may be treated in this manner, and greatly benefited.

The quantity of saleratus necessary to add to the collodion is not material—an excess will do no harm; but it is recommended to pour off from the sediment of saleratus into another bottle, to allow it to become clear for use.

The addition of albumen, or the white of an egg,

to a quantity of collodion, and allowed to settle, is also of great benefit to it, especially if it has a tendency to remain thick and turbid.

CHLOROFORM IN COLLODION.

A few drops of chloroform may be added with advantage to collodion when it appears weak on the glass plate, and inclines to break on the application of water in washing off the developer.

TO KNOW IF ALL THE HYPOSULPHITE OF SILVER IS REMOVED FROM THE PRINTS BY WASHING.

When the prints are supposed to be well washed and hung up to dry, allow a few drops of the water from them to fall into a solution of bichloride of mercury. If a white precipitate is formed, the print is not well and sufficiently washed. It will in process of time fade or change color. They should be washed again until no precipitate is seen.

PRINTING BACKGROUNDS OF VARIOUS SHADES.

Any negative with a dark background may be printed with a light one, or *vice versa;* or if an imperfection happens to occur on the background, it may be entirely removed by the printing process, as follows:

First print an impression, and without toning it,

remove it from the printing frame, and cut out the figure of the head and body with a knife or small scissors; in fact, leaving entirely the background separate from the portrait. Fasten this background of paper so cut out around the edges, by means of gum-arabic, upon the negative, and print only the portrait, on another paper of course, leaving the background perfectly white. Now remove this print, and cover the portrait so printed with the piece of paper which was cut out of the first print. This will now become blackened by the action of light, and it must be attached to the second print only at the bottom by gum-arabic. Place it in the printing frame, which contains a clean glass, and expose the background only to the action of light. Of course any degree of shade of background may be attained, and gradations of the light or dark portions can be also given by holding a cloth or piece of card-board over such portion as may be desired of a light color. The card-board should be slightly agitated to prevent any sharp lines on the print.

Figures of various kinds can be represented on the background by means of lace-work, or any open work laid over the background in the second process.

In printing these extra backgrounds, there will necessarily be a sharp outline around the edge of the hair and drapery, which can be removed by retouching with india ink, after the picture is mounted.

PRINTING FRAMES.

There are numerous methods and apparatus in use for holding the negative and paper during the printing process. The common printing board is perhaps the most useful. They can be bought at any of the dealers in photographic materials.

Another kind called pressure frames are rather more expensive, but possess the advantage over the common printing board of giving the operator an opportunity to inspect both ends of his picture during the printing process. Every operator should possess more than one of these printing frames, as the saving of time will amply repay him if he has many prints to make.

Another cheap, convenient, and equally good arrangement for holding the negative and paper, is to take three glasses—say one a full size, being the one having the negative upon it; and then take two glasses, each just half the size of the negative, and have a piece of *very thick heavy* cloth, cut the size of the negative glass, which can

be put between it and the two half glasses, and then they can be held together by means of the common spring clothes-pin. The advantage of the two glasses at the back is, that one can be entirely removed while the picture is being examined, and afterwards returned without in the least moving the impression.

CHAPTER VII.

HINTS AND SUGGESTIONS IN REGARD TO THE NEGATIVE PROCESS—IMPERFECTIONS PECULIAR TO NEGATIVES —HOW TO AVOID THEM—CAUTIONS IN TAKING NEGATIVES—HINTS AND SUGGESTIONS IN REGARD TO PRINTING POSITIVES ON PAPER—CAUTIONS IN REGARD TO THEM—IMPERFECTIONS FOUND IN POSITIVES—HOW TO AVOID THEM.

The art is so full of details in the manipulations, that it is deemed proper to embody in a chapter many hints and suggestions that are very necessary to be well studied by those who adopt the line of practice laid down in this work. In that portion of this Manual devoted to the Ambrotype, will be found a chapter devoted to the failures, &c.; also containing many valuable hints in regard to positives on glass—all of which are valuable as a reference in the negative process.

HINTS AND SUGGESTIONS IN REGARD TO NEGATIVES.

The addition of a small quantity of white sugar, dissolved in water, to the nitrate bath, will sometimes increase the intensity of the negative. The addition of an ounce of alcohol for every quart of water in the bath, will also increase the intensity.

When the collodion will not adhere to the plate on removal from the bath, add a few drops of water to a sample of collodion, and it will generally remedy the defect. If the defect is removed in a small quantity, add water to the whole.

RETOUCHING NEGATIVES FOR PHOTOGRAPHIC VIEWS.

In photograph views, the sky is not usually very truthfully represented. It almost always appears too dark when representing a thunder tempest, or when the landscape, or whatever may be taken, betrays a shining sun. This unnatural effect may be overcome in the following manner:—The black varnish which is used for Ambrotypes, can be reduced by the addition of spirits of turpentine, and with a small brush spread it over the entire sky. If it still prints too dark, give it another coat; and if a white is desired, the negative must be made entirely opaque.

Beautiful clouds and sunset effects may be introduced into the photographic landscape, and at the expense of very little time. The tempestuous storm, the dark and dismal cloud, with the vivid flash of lightning dancing upon its thundering bosom, the rainbow and other scenes of grandeur and beauty, may be represented in the photographic drawing.

RETOUCHING NEGATIVE PHOTOGRAPHS.

This is best accomplished with india ink, and some other lighter color to modify it; the black spots may be retouched to their proper transparency or opacity. Shadows, if too deep or too feeble, may be corrected; defects in the eye also, if shaded too deep, may be corrected by a careful hand, guided by the use of a small camel's-hair pencil.

ENGRAVING THE NAME UPON A NEGATIVE.

Any name may be engraved upon the negative by marking it carefully with a pointed instrument —such as a needle or the point of a knife—before it is varnished. When printed, this will appear very distinct.

IMPERFECTIONS COMMON TO NEGATIVES.

The more frequent imperfections are those termed fogging, streaking, and spotting of the negative plate.

The causes are—*over-exposure in the camera, over-developing, impure chemicals, and light gaining access to the chemical-room, camera, or plate-holder.*

The over-exposure in the camera is easily obviated by lessening the time. The over-developing can be obviated by lessening the time also, and weakening the developer—changing the quantity of acetic acid.

The impurity of the chemicals in the collodion can only be ascertained by having a sample of collodion known positively by previous experiment to be of the good quality. Make a trial of this, and compare results.

Light gaining access to the Chemical-room, Plate-holder, Camera, &c.—After coating the plate as usual in the dark room, hold it in your hand for a few moments; then, without taking it out to the light, pour on the developer. If the plate blackens, white light gains admission to your chemical-room. *Make it darker.* If the cause is

not here, coat another plate, put it in the plate-holder, place it in the camera, and, without taking the cap off the tube, raise the slide, and expose the plate for a few seconds in the darkened chamber of the camera—remove it to the dark room, and pour on the developer; if it blackens, stop the leaks in the camera. If this does not obviate the trouble, coat another plate, put it into the plate-holder, place it in the camera, and, *without removing the cap or raising the slide*, leave it a few seconds as before; remove to the chemical-room, pour on the developer; if it blackens, the plate-holder is not tight. These trials will generally disclose the cause of fogging.

Sometimes the cause may be removed by adding acetic acid to the bath when all other means fail. This is an excellent remedy for fogging generally, and will, in nine cases out of ten, obviate the difficulty.

Specks upon the Plate.—These may occur from the use of collodion holding small particles in suspension, or from too much acid in the developer. Never use a sample of collodion until it has stood long enough to settle perfectly clear. All new collodions must be set aside where they will be undisturbed twenty-four hours before using.

Oily Spots or Lines up and down the Plate.—These occur when the plate is taken out of the silver bath, before the ether and alcohol have been washed away. Marks of the same shape occur, also, when the developer does not amalgamate readily with the surface of the film; in which case add a little alcohol to the developer.

SILVERY APPEARANCE OF NEGATIVES.

Negatives sometimes have an appearance of silver under the collodion after developing, which is owing mainly to the imperfect cleaning of the plate. This is more likely to occur when old plates are used. To avoid this, use nitric acid diluted and rotten-stone in the next cleaning. Glass which is rusty will always present this silvery appearance. It must be discarded.

Transparent Markings of various Kinds.—These sometimes resemble fern-leaves, and other vegetable forms: add a few drops of chloroform to the collodion. Dark spots of various forms may be caused by the collodion setting too long—or by pouring on the developer entirely on one place—or by having the developer too strong. Apply the remedies before recommended.

THE STRENGTH OF THE NITRATE BATH.

The last and highly important imperfection is often caused by the want of silver in the bath. A weak bath is indicated by certain parts of the plate having the appearance of transparency, as though no collodion was upon its surface. Test the bath with the hydrometer to ascertain the quantity of silver, and add enough to render the quantity equal to that required for the collodion, to be used generally 50 grains to every ounce of water.

There are, perhaps, many other imperfections in the negative process, which, were they fully enumerated here, would tend most likely to mislead rather than give information.

It is hoped that the practice of the art, as laid down in the pages of this work, will not cause so many failures as will deter the persevering student; assured that although the process is fraught with difficulties, it has been entirely overcome by many successful artists, the evidence of which is afforded by their works.

HINTS AND SUGGESTIONS IN PRINTING POSITIVES ON PAPER—PHOTOGRAPHIC PAPER.

The quality of paper is very important, and must be of an even texture, and free from holes

and spots when held up to transmitted light. One side must have a satin appearance when viewed at an angle across the surface.

There is one side only of good photographic paper which will receive the best impression, and that may be known by examining it carefully. The one side will appear to have lines crossing, each resembling fibres in woven cloth. The opposite side will appear to show like satin, which is the one to receive the silver.

Avoid dust in the room where the paper is silvered and hung up to dry. Especially be careful to exclude it from the silvering solutions by frequent filtering.

WASHING POSITIVE PRINTS.

In washing positive prints great care must be observed that the dishes used are free from any foreign substance, as that would invariably cause spots or stains. The dishes mostly in use are gutta-percha or vulcanized india-rubber. With large prints, wooden dishes may be used if they are well varnished with gum shellac varnish.

The use of warm water to finish the washing is highly recommended, as in

that state the hyposulphite of silver is much more soluble.

The value of the use of the chloride of gold in the toning bath has never been sufficiently estimated. It adds to the tone all the beauty so much desired. An increase of the quantity in the toning bath will frequently overcome the many disagreeable colors which are so often found in prints after washing. Its use in the finish of the Daguerreotype was considered indispensable. Those who seek for the most beautiful Photographs must use large quantities of this metallic salt.

RETOUCHING PHOTOGRAPHS.

All Photographs, when mounted, can be improved by slightly retouching them with a small camel's-hair brush dipped in india-ink. Especially the eyes, lips, &c., which frequently will not print clear and distinct. The ink can be ground on a piece of glass, using only a small quantity at a time. By mixing a small portion of carmine with the india-ink, any shade may be produced to correspond with the color of the print, and all the white spots that so frequently appear on the background and drapery can be removed. A slight touching of the ink on the shadows of the nostrils

and lips will add greatly to the beauty of the Photograph.

Should any black spots require removal, use white water-color paint mixed with india-ink. This retouching will require only a short time, and must be done before varnishing.

IMPERFECTIONS FOUND IN POSITIVES ON PAPER.

If the print has a faded and yellow appearance, the hyposulphite is acid, or too old and weak; or the print has been left in it too long a time, or has been washed too slowly. Add more chloride of gold; if acid (which may be known by testing with litmus paper), add a few drops of aqua ammonia.

If not sufficient contrast exists between the lights and shadows, the print being pale, and without vigor, then the nitrate of silver solution is too weak in proportion to the salt solution. Strengthen the silver solution.

If too much contrast exists between the lights and the shadows, and the details are not marked in the latter, then increase the proportion of salt.

If pale spots appear, then there has been insufficient absorption of the nitrate of silver by the

paper; this may result from the unequal texture of the paper, or from the silver being too weak.

Black spots are caused by dust on the surface of the silver solution, organic matter on the paper, or metallic particles in the paper. Be careful to avoid them.

If the prints after drying have a mottled appearance in the high lights, they have not been sufficiently toned. The prints should always be held up and examined by transmitted light before removing them from the toning bath.

If the bath is too weak, these spots cannot be removed except by adding more hyposulphite and chloride of gold to the bath.

These imperfections noticed as found in positive pictures on paper, probably do not include all, but those which are most likely to be encountered in the practice of the art. They are given as material for reference during the practical operations of the photographer, and should be often referred to in his leisure moments.

THE

AMBROTYPE MANUAL.

PART II.

PRACTICAL DETAILS

OF THE

AMBROTYPE PROCESS

POSITIVE PHOTOGRAPHS ON GLASS.

CHAPTER VIII.

THE CAMERA—PLATE-HOLDERS NECESSARY FOR THE CAMERA—PREPARING THE GLASSES—PLATE BLOCKS FOR HOLDING THE GLASSES—CLEANING SUBSTANCES—CLEANING THE GLASSES—CLEANING OLD GLASSES—REMOVING THE VARNISH—HOLDING GLASSES AFTER THEY ARE CLEANED—GLASSES USED A NUMBER OF TIMES—QUALITY OF GLASSES NECESSARY FOR AMBROTYPES.

It is presumed that most persons in whose hands this book may fall, or at least those who see it after having sought it, are acquainted with the Daguerreotype process, and possess a camera, and all the apparatus necessary for Daguerreotypes. It is needless to add to those who have had any experience, that a good camera is indispensable, much more so than in the Daguerreian process. Without this necessary auxiliary, all labor will be but in vain.

An entirely new plate-holder for the camera is requisite, known as photographic frames, for holding the glass. It is made in such a manner that

the glass plate will rest on each corner on glass itself. These holders are absolutely indispensable, because all attempts to use the old Daguerreian plate-holders will invariably produce bad results. These plate-holders can be obtained of any of the dealers in materials for the art.

The glasses, of course, have sharp edges, which may be filed off with a coarse file, or ground on a grindstone, to avoid cutting the fingers in handling. The wooden vise, which has been so often used for Peck's patent blocks, will answer a very good purpose for holding the glasses while cleaning them. It is better to procure two such vises —one for the acid and rottenstone, and the other for the alcohol.

The place where the ends of the glasses rest may be slightly raised, so that in passing the canton-flannel, or buff, over the glass, it shall pass entirely over the end or sides.

The plate vise may be dispensed with, and a flat pine board may be used, covered with canton-flannel, of a size longer than the glasses that are to be cleaned. On the edge of this board must be nailed a narrow piece of hard wood, raised just above the edge, but not so high as the thickness of the glass to be cleaned. Now, by pressing the glass against

this edge with a small stick of hard wood, or the left hand, the glasses will be held, and readily cleaned with the other.

New glasses require cleaning first only with alcohol, or with alcohol and rottenstone. Common whiting has been found to answer the purpose even better than rottenstone. They are to be rubbed with canton-flannel, or tissue-paper, and then dried with the same substances. The plate must be rubbed in lines, round and round, and on both sides. It does not require as long rubbing as the Daguerreotype plate. After which, it is necessary to buff them with two buffs, like a ball covered with soft buckskin. This ball may be made of cotton, and covered with buckskin, with a handle made of the ends of the skin, drawn over, and tied with a piece of twine. The first ball, or *tampon*, may be rubbed with rouge, or rouge and calcined lampblack. The second is to be kept free from all polishing substances. Rub first with the rouge buff, and finish quickly with the dry one. By slightly breathing on the surface, one can readily ascertain if the plate is clean, which will be indicated by a uniform condensation of the moisture. Both sides of the glasses should be rubbed; also the edges of all should be wiped with a small

piece of canton-flannel, before using, to remove any of the polishing substances which might adhere to the glasses.

Glasses which have impressions on them, and are dried, should first be placed in a flat dish containing water, or water and nitric acid, enough to make the liquid act slightly on the silver. They are then to be rubbed with rottenstone, or whiting, mixed with water and nitric acid—about two drachms of acid to four ounces of water. They are then to be thoroughly washed with pure water, and allowed to stand a few moments, or they may be immediately wiped dry with a clean towel. They are now ready for the alcohol and the canton-flannel process, which is effected without any application of rottenstone or whiting, although a small quantity of either may be used with the alcohol.

After the plates are buffed, they may be placed on their edges in some old plate-boxes which have done service in the Daguerreian art. The grooves can be cut out a little wider than those for plates, and then placed on the shelves near the bath, or laid on the edges ready for coating.

Old pictures which have been fitted up with the various varnishes require more care in cleaning.

They should be first placed in a strong solution of spirits of turpentine and alcohol, and allowed to remain there until the varnish becomes softened. Then they should be submitted to the acid and rottenstone, and finished in the same manner as glasses with pictures without varnish. It is well to place all pictures which are failures in water as soon as possible, rather than to allow them to dry with the collodion on them.

The towel used for wiping the glasses should be used only for that purpose, and no soap, or any other substance, should be allowed to soil it. When washed, it should be only with soda, instead of soap, to insure more complete success.

The glasses should always be kept away from any dampness and dust. Great care must be taken that no vapors of chemicals should come in contact with glasses after they are cleaned. Other substances may be employed, such as tripoli powder, photogene, &c., care being taken to remove all the polishing substances before the plate goes into the bath.

Glasses, unlike Daguerreotype plates, may be cleaned and used a great number of times; but they will require more careful polishing after a few impressions are made, and it has even been

asserted by some operators that they will actually loose their sensitiveness after a few trials. It is well, therefore, not to use the glasses too long; yet the practice is so variable, that some kinds of glass may answer, whilst others may be useless.

The finest quality of plate glass is best adapted for Ambrotypes, and that which is free from color will produce the most pleasing effects. Many persons, however, use an inferior quality of glass, which of course is a great detriment to their pictures. The thickness of the glass is of some consequence. It should not be too thick, else the picture will appear unnatural. A medium thickness is to be obtained, if possible.

CHAPTER IX.

APPARATUS FOR AMBROTYPES—CHEMICALS USED—SUBSTANCES FOR FINISHING THE PICTURE—PREPARATION OF THE NITRATE BATH—TO IODIZE THE BATH—FILTERING PROCESS—ADDING ACID—NEUTRALIZING THE BATH—FULL DIRECTIONS FOR KEEPING THE BATH IN ORDER—RENEWAL OF THE NITRATE OF SILVER.

THE following are the various utensils, or apparatus, necessary for the Ambrotype process:

APPARATUS.

One gutta-percha bath.

One dipping rod—glass or gutta-percha.

One flat dish for fixing solution, either of earthenware or gutta-percha—the latter preferred.

One large earthen dish for the developing solution.

One bottle for the developing solution, capable of holding two quarts.

One four, or six ounce graduated glass.

One large bottle, with a glass stopper, capable of holding more than the silver bath, and to be used *exclusively* for that purpose.

Three glass or gutta-percha funnels, to be used respectively for the nitrate of silver, the developing solution, and the fixing bath.

One actino-hydrometer, for testing the nitrate bath.

A new and distinct plate-frame, for holding the glass plates when placed in the camera.

One pair of scales, containing apothecaries' and avoirdupois weights.

Cotton for filtering.

Two or three glass rods.

The following chemicals will be found necessary:

CHEMICALS.

Nitrate of silver (crystallized).	Iodized collodion.*
Protosulphate of iron.	Nitric acid, chemically pure.
Acetic acid.	Glacial acetic acid.
Alcohol 95 per cent.	Litmus-paper, blue and red.
Cyanide of potassium.	Iodide of potassium.
Hyposulphite of soda.	Carbonate of soda.

The following substances are required to finish the picture:

REQUISITES FOR FINISHING.

White varnish.	Gum demar varnish.
Black varnish.	Venetian or Canada balsam.
Amber varnish.	Daguerreotype sealing-paper.

Being supplied with all the various utensils and chemicals, the first and most important preparation would be the nitrate of silver bath, and herein

* The preparation of the collodion will be found in Chapter XI.

lies one of the main secrets of success in all the practice. Unless the bath be properly prepared at the outset, with all care in manipulating and in the compounding of the other chemicals, all the productions will be failures.

The bath once in a proper state, success is much more easily attained.

First measure the bath by filling it with water, then pouring it into the graduated glass to ascertain the exact number of fluid ounces which the bath contains. To every ounce of water in the bath must be added forty grains of nitrate of silver, pure and crystallized, and free from acid. Test a small quantity of nitrate of silver in solution with blue litmus-paper. If any acid is present, the paper instantly becomes red.

By calculation the quantity required for the bath can easily be ascertained, as there are 480 grains to every ounce. If the bath contains two quarts, or 64 ounces, it will require exactly 2,560 grains, or $5\frac{1}{3}$ ounces of the nitrate of silver. Thus:

$$64 \times 40 = 2560 \div 480 = 5\tfrac{1}{3} \text{ ounces.}$$

Procure distilled water in all cases, if possible; but if this be not always obtainable, pure soft water, which has been boiled and filtered, may

answer. In no case use water that has any trace of lime or soda.

As a test of pure water may not always be at hand, it is well to take a few grains of nitrate of silver, and drop it into an ounce of the water before using. Should it appear to dissolve, or throw down any precipitate, you may be assured that the quality is not good, and it will not answer for the bath.

Dissolve all the silver, except one ounce, in the water, which must be placed in the large glass-stoppered bottle appropriated expressly for the bath, reserving, also, about four or six ounces of the water intended for the bath, which may be placed in the graduated glass. Into this put the extra ounce of nitrate of silver, and dissolve.

TO MAKE THE IODIDE OF SILVER FOR THE BATH.

Take about twelve grains of iodide of potassium, and dissolve it in one ounce of water, and add to it two drachms of the nitrate of silver solution from the large bottle. Avoid strong daylight in this process. Immediately there will be seen a yellow precipitate, which is the iodide of silver. This must now be well washed three or four times

with soft water, by adding eight or ten ounces at a time, and allowing it to subside, when the superfluous water must be poured off; then add fresh water until all the potassium is washed out, leaving the pure iodide of silver.

This iodide of silver is now to be poured into the six ounces of water in which one ounce of nitrate of silver was dissolved. Stir it with a glass rod, and after it is partially dissolved, pour the whole into the large bottle containing the solution for the bath; shake it well, and filter through the funnel expressly reserved for the nitrate bath.

This amount of iodide of silver will be required for a bath containing two quarts. The same proportions must be observed for baths of other dimensions.

FILTERING PROCESS.

The best filter is composed of clean cotton, which must first be saturated with alcohol, and afterwards thoroughly washed out with water. This filter is preferable to all others for photographic purposes; and in all cases where filtering is required, it is strongly recommended.

The color of the bath should at first appear to be a milky hue, but after filtering once or twice

(as may be necessary), it should be clear as water There will be a portion of the iodide of silver which will not be dissolved. This must in all cases be filtered out, and the solution rendered perfectly clear before it is ready for use.

After the bath is clear, test it with the hydrometer made expressly for the purpose, to ascertain if it be of the required strength—viz., forty grains to the ounce, which will be indicated on the scale graduated according to the table in the book accompanying the hydrometer.

The bath must also be tested with blue litmus-paper, by cutting off a small slip, and dropping one end of it into the solution. If it turns red, you have already a portion of acid.

A small quantity of acid is necessary to produce the required tone and effect of the collodion, and also to remove any streaks that may sometimes present themselves.

Two kinds are used, chemically pure—viz., nitric and glacial acetic acid. The former has been said to produce the finest white tones, yet it is more liable to change the nature of the bath, while the latter is said to possess a more uniform action, and to work with great regularity.

The quantity used, however, of either is very

small—not over eight or ten drops to be added at first. Should lines appear running up and down the plate, five or six drops more may be added. Of course only one kind of acid is to be used at a time.

TO NEUTRALIZE THE NITRATE OF SILVER BATH.

In order to neutralize the bath, dissolve half an ounce of carbonate of soda in two ounces of water; then pour into the solution a drachm or two at a time, quickly shaking the bottle. The bath will assume a whitish appearance, which will disappear on shaking the bottle. When a sufficient quantity of the soda has been added to neutralize all the acid, this whitish appearance will remain after shaking the bottle. As soon as that is seen, there can be no more soda added without injury to the bath. Try the litmus-paper, and when enough soda has been added, it will of course remain unchanged.

Sometimes caustic potash is employed to neutralize the bath, when a brown precipitate falls, instead of a white. If nitric acid has been used, and one desires to employ the glacial acetic instead, it can be easily neutralized by the foregoing process, and the latter acid added.

Sometimes a perfectly neutral bath will succeed well in the Ambrotype process, and it is even recommended at first to be used in that state before adding the acid—the acid being added only when the lines make their appearance on the plate.

The bath should always be kept as much excluded from the light as possible, and also covered, to avoid collecting dust and other foreign substances. It may remain constantly in the gutta-percha dish without serious injury. Many operators prefer pouring it into the bottle after the labors of the day, both for safety from accident, and also on the score of cleanliness.

Avoid the introduction of any vegetable or metallic substance into the bath, or the slightest particle of alkaline ingredient, in any form. It frequently happens that particles of collodion will leave the plate, and be found floating in the bath. Whenever this occurs, it is necessary to filter it.

The gutta-percha bath should be arranged in a square box or frame, at an angle of about thirty degrees, or, what is better still, a covered box, that should open when desired, and cover the whole when not in use. A dark cloth may also be employed to cover it.

There should always be a sufficient quantity of

the nitrate of silver solution reserved in the large bottle to keep the bath full during the time of operating. An ounce of nitrate of silver, or a less quantity, may be dissolved in the bottle, without the addition of the iodide of silver, as in the first preparation of the bath.

Some operators flow their bath only in the morning, in order to remove the dust which collects on the surface, and would fix itself on the first plate introduced were it not so removed.

Avoid the contact of the human hands with the nitrate bath, as every drop leaves an indelible stain.

It is recommended to obtain a box which will support the plate-holder in an upright position after the plate is in it, previous to being placed in the focus of the camera, thereby avoiding damage to the floor or carpet upon which the camera stands.

A nitrate bath once prepared according to the foregoing plan, and in good working order, will remain in action for years, by adding occasionally a little more acid, say ten drops at a time, when lines appear, and nitrate of silver when required. After using a bath for a great number of impressions, it will be necessary to add more iodide of

silver, which must be done in the same manner as described on page 134.

When the bath requires a renewal of the nitrate of silver, as it necessarily will, after a given quantity of plates have been prepared, the impressions will appear to be covered unevenly with silver, after the application of the fixing solution.

Test the bath with the hydrometer, and add more silver to bring the strength up to the requisite standard—viz., forty grains to each ounce of water.

CHAPTER X.

THE DEVELOPING SOLUTIONS—MANNER OF COMPOUNDING THEM—VARIOUS FORMULAS FOR DEVELOPING SOLUTIONS—TEST OF ACETIC ACID—THE FIXING SOLUTIONS—CYANIDE OF POTASSIUM—HYPOSULPHITE OF SODA—ADDING CHLORIDE OF SILVER.

THE DEVELOPING SOLUTION.

The chemicals used in the developing solution are sulphate of iron, acetic acid, and alcohol.

℞.	Sulphate of iron, ...	2 ounces.
	Acetic acid, No. 8, ...	2 ounces.
	Alcohol (either 80 or 95 per cent.), .	1 ounce.
	Water, ...	1 quart.

The sulphate of iron should be of pure quality, which may be known by its clear and transparent green crystals.

Dissolve the iron and water, and filter; then add the acetic acid and alcohol, keeping it in a glass-stoppered bottle, ready for use. Use it by pouring out a small quantity at a time in an open mouthed bottle, which will contain six or eight ounces.

Some prefer to add the acetic acid and alcohol, preserving the same proportions in the same bottle as it is required for use.

If one is not consuming it very rapidly, this latter plan is recommended.

It has been found, when all the ingredients are mixed at once, that the developing solution becomes changed after standing a few days, and a precipitate is formed.

In order to facilitate the dissolving of the sulphate of iron, it may be pulverized in a mortar, and warm water added instead of cold.

This solution is to be used only once upon the plate, as it forms with the silver another substance, which, on a second application, would injure the picture. Some operators, however, have filtered and used it again by adding a small quantity of acetic acid.

There are other solutions and other formulas for the developer which are highly recommended, a few of which are given:

No. 1.	Proto-sulphate of iron, . .	2 ounces.
	Acetic acid, No. 8, . . .	2 ounces.
	Alcohol, ...	1 ounce.
	Nitric acid, ...	½ ounce.
	Water, ...	1 quart.

No. 2.	Proto-sulphate of iron, . .	4 ounces.
	Acetic acid, No. 8, . . .	4 ounces.
	Alcohol, ...	4 ounces.
	Water, ...	1 quart.
No. 3.	Proto-sulphate of iron, . .	3 ounces.
	Acetic acid, No. 8, . . .	3 ounces.
	Alcohol, ...	3 ounces.
	Sulphuric acid, ...	½ ounce.
	Water, ...	1 quart.
No. 4.	Proto-sulphate of iron, . .	1 ounce.
	Nitrate of potash (refined nitre), .	¾ ounce.
	Acetic acid, ...	3 ounces.
	Water, ...	1 quart.

The foregoing receipts are given mainly to indicate the various processes, all tending to the same results. The addition of nitric acid and sulphuric acid has been said by some to render the pictures whiter. But this is doubted by others; and the result of a long experience has shown that the first receipt here given will produce the best pictures.

There are many impurities of acetic acid, and it is necessary to test it, which is done by putting merely one or two drachms of the silver solution from the bath into a small quantity of the acid, or either dissolve a small quantity of nitrate of silver, and add it to the acid. If the acid exhib-

its any precipitate, it will not answer for the purposes of a developing agent.

THE FIXING SOLUTIONS.

The fixing solutions are composed of cyanide of potassium and hyposulphite of soda, as follows:

No. 1.	Cyanide of potassium, . . .	½ ounce.
	Water, ...	1 pint.

Dissolve and filter, and it is ready for use.

No. 2.	Hyposulphite of soda, . .	4 ounces.
	Water, ...	1 pint.

Dissolve and filter.

The fixing solutions are very simple, and easily kept in order, except that, after using for a number of pictures, they will require strengthening.

Some operators add a small quantity of chloride of silver to the solution, and it is said it will render the pictures of a whiter and purer tone.

Filter this solution often, and avoid dust and other foreign substances.

The cyanide of potassium fixing solution is the one greatly preferred, and most commonly used for the Ambrotype process.

CHAPTER XI.

ON THE PRACTICE OF THE ART IN ALL ITS DETAILS, FROM THE CLEANING OF THE PLATE TO THE APPLICATION OF THE FIXING SOLUTION—DRYING THE PICTURE.

The practice of this art is such, that a careful and accurate manner of the manipulating through the whole is necessary to insure success.

It is absolutely necessary to have a dark room, or one that can be made so at will, and yet a lamp or candle will be required in some portion of the process, or if a window is arranged with a yellow reflection within the room by yellow cloth or reflectors it will answer as well. The lamp should be placed behind a yellow glass, so that whatever light falls upon the glass plate shall be of a yellow hue, as the plate is very sensitive to the light on its removal from the bath. By some operators it is asserted that all these precautions are not necessary.

The plate glass is first to be cleaned thoroughly,

according to the directions in a former portion of this work. It is then well brushed off with a soft camel's-hair brush, in order to remove all the dust.

Standing near the bath with your collodion well decanted, as described in the section of this work devoted to collodion, holding the glass in your left-hand thumb and finger, pour out very carefully a continuous stream of collodion upon the middle of the plate, sufficient in quantity when allowed to flow entirely over, to cover it entirely.

Allow the collodion to flow first to the lower left-hand corner, then to the lower right-hand, and finally let the superfluous quantity return into the bottle at the right-hand corner near the thumb. A little practice will enable one to pour the collodion on the glass, and return that portion not required to the bottle without waste.

Avoid any contact of the collodion with the thumb, as streaks will be caused thereby; but if a portion should run on the opposite side of the glass, it will not injure the picture, as that can be easily removed after it is taken from the fixing solution.

Hold the plate nearly horizontal with the daylight on it, so that the light shall reflect on the surface of the glass, and always retain the position

of it down, in the same manner as it was when the collodion was poured into the bottle from the glass —that is, the end where the collodion left the plate must always be kept lower than the other portion. As soon as the film appears to be drying, as it will in a few seconds, and when, by just placing the finger on a corner of the plate, the collodion becomes of a glutinous nature, or, rather, as soon as it is set, immerse it in your bath, with the same lower portion of the plate down as when you were setting the film.

The plate should never be entirely dry, but hold a medium between moisture and dryness. The light must now be excluded from the bath, either by covering it with a dark cloth, or closing the box containing the bath, or the door of the room, and the plate allowed to remain in the bath one or two minutes. It may then be carefully raised from the bath, and if a film of iodide of silver is formed sufficient for its removal to the camera, it will assume a perfectly smooth appearance on viewing the surface; but if the glass is removed too soon, it will have the appearance of grease, and run in lines down the plate.

In order to facilitate the process, you can move the glass slightly from side to side in your bath,

raising it carefully, and viewing the surface, or the plate may remain in the bath three or four minutes, during which time the person whose likeness is to be taken may be placed in position.

On removing the plate from the bath, care should be observed that no daylight falls upon it. The nitrate of silver should be allowed to run off for a few seconds into the bath before placing it in photographic frames. After the plate is in the frames ready for the camera, it must always remain in a perpendicular position, leaning against the wall, or some other substance. Never allow it to be placed horizontally from the moment the glass is in the frame until it is developed, or lines will be produced on the plate. Before the next plate is placed in the frame, it must be carefully wiped dry with a dry cloth or towel.

As short a time as possible should elapse after the glass is in the plate-holder before placing it in the focus of the camera. The time required in the camera, of course, must be determined by actual experiment.

The plate is then taken to the developing stand, which must be so arranged that water can flow on the plate at any moment, after pouring on the developing solution. Holding the plate again

in the left hand, as in using the collodion, over a large dish sufficient to receive all the solution that will not remain on the surface, quickly pour over the developing solution on the right-hand side of the glass, enough to cover it all at the same instant, and move it over the whole surface, as in gilding a Daguerreotype plate. The picture will quickly appear; and as soon as the outlines of the drapery are seen distinctly, then apply the water to the surface in a gentle stream, so as not to remove the collodion film.

A little care and experience will be necessary in the developing process, for in this consists the great beauty of the picture. By a proper development all the fine half tints are produced, and the drapery is brought out with distinctness.

It is preferred by some rather to over-time the picture in the camera, and use a shortened developing process, yet the best results are attained by the exact time of exposure, combined with the proper development. It is well known that the longer the picture is developed, the lighter it becomes; but beyond a certain length of time, a disagreeable tone is produced. It is necessary, therefore, to allow sufficient time in the camera for the picture to be developed in the usual manner.

About ten or fifteen seconds, in ordinary temperature, is long enough for a successful development. This, however, is subject to a variety of changes, which must be learned by actual experience.

After thoroughly washing the solution from the glass on both sides, lay it in a flat dish containing the fixing solution, with the collodion side uppermost. This may be performed in the light of day. If cyanide of potassium is used, it will remove the iodide of silver which has been unchanged by the action of the light in a few seconds. But if hyposulphate is used, it will require somewhat longer. As soon as the picture is seen clearly, be careful to remove it, to wash all the fixing solution from the glass with a good supply of soft water, as the slightest trace of these solutions will injure the picture.

The plate can now be dried by a gentle heat of the fire, but not too quickly, as streaks will be formed. It is now ready for the varnishes.

The glasses may also be dried by the application of the spirit-lamp, care being used to avoid too great heat, which will cause the glass to break.

CHAPTER XII.

THE MANUFACTURE OF GUN-COTTON—TEST OF THE ACIDS EMPLOYED—WASHING AND DRYING THE GUN-COTTON—PREPARATION OF THE COLLODION—ITS NATURE AND PROPERTIES—ETHER AND ALCOHOL—TO IODIZE COLLODION FOR AMBROTYPES—METHOD OF PRESERVING COLLODION, AND KEEPING IT READY FOR USE—TESTS OF GOOD COLLODION—TO REMOVE THE COLOR FROM COLLODION.

A work like this would be incomplete without full and practical details relative to the preparation of gun-cotton, and its conversion into collodion, although the manufacture of it is attended with considerable difficulty and uncertainty. It is recommended to beginners, therefore, to purchase their collodion of those more experienced operators, when only a small quantity is required. Indeed, the manufacture of gun-cotton itself is liable to great variation, as well as being very deleterious to health. It is found that even those who make collodion for sale, purchase their gun-cotton

ready made. Both gun-cotton and collodion are all perfectly iodized and warranted. They can be found for sale by most dealers in Daguerreotype goods.

Collodion is so called from a Greek word, which signifies "to stick." It is a transparent fluid, procured generally by dissolving gun-cotton in ether, or ether and alcohol.

It was discovered by Professor Schöenbein, of Basle, Switzerland, in the year 1846, and was first used for surgical purposes only, being smeared over fresh wounds and raw surfaces, in order to preserve them from contact with the air by the tough film which it leaves on evaporation. It is now sold by druggists for the same purpose; but photographers have hailed the discovery of collodion as the final keystone to their wonderful art, and they draw large contributions from this substance. It is consequently of great importance that its preparation should be the most complete and exact that can be attained.

Gun-cotton is procured by immersing the pure clean fibres of cotton in sulphuric acid and nitric acid, or sulphuric acid and nitrate of potash.

If a large quantity of gun-cotton is desired, the mixture of nitric and sulphuric acid is generally

adopted. For photographic purposes, however, the mixture of nitrate of potash and sulphuric acid is used as follows:

TO MAKE GUN-COTTON.

Granulated nitrate of potash, . .	6 ounces.
Sulphuric acid, ...	5 ounces.
Pure cotton, ...	160 grains.

The nitrate of potash should be pulverized in a porcelain mortar, and the sulphuric acid added and mixed until a thick pasty substance is formed, when the cotton must be quickly immersed, and stirred with a glass rod, so as to thoroughly incorporate the cotton in the mixture. Then pound the cotton slightly for a period of ten minutes. When the cotton assumes a stringy appearance, and on separating the fibres, it breaks easily, it must be quickly immersed in a quantity of water to remove the acid, after which it is to be well washed for ten or fifteen minutes in water, constantly changing it, until all traces of the acid disappear. Great care is necessary to be observed in preparing the gun-cotton. It should be made in an open space, where free circulation of air is obtained, in order that the deleterious fumes of the acid shall pass away. The quality of the ingredients is

highly essential. The rectified nitrate of potash, known as "Dupont's granulated nitre," is preferable. The acid should be of the specific gravity of 1.860, and free from water.

On mixing the acid and nitre, the temperature should be raised to about 140°, or it will become so if they are of the required quality, in consequence of the small quantity of water contained in the nitre.

The most expeditious plan to wash the acid out is to have running water, as from a hydrant.

As soon as the acid is completely washed out, which may be ascertained positively by using litmus-paper, the cotton is then to be placed in alcohol, in order to remove all traces of water; then by wringing it out in a clean towel, all the alcohol can be removed, and it is then ready to spread out on white paper to dry, which will be done in a few moments.

If the manufacture of the gun-cotton, as above described, has been successful, the product will be capable of the following conditions: A small quantity will explode on the application of heat. It will dissolve readily in a solution of alcohol and ether, in certain proportions, without leaving much residuum.

The manufacture of gun-cotton is usually attended with many difficulties, and liable in all cases to result in failure from the slightest variation of the process, and withal is quite detrimental to health. It is therefore recommended to purchase the gun-cotton, when possible, thereby saving all the perplexity and uncertainty attending its preparation.

PREPARATION OF THE COLLODION.

Assured that you have a good quality of gun-cotton, the preparation of the plain collodion is attended with very little difficulty. The proportions are as follows:

Sulphuric ether, concentrated, sp. g. 720	10 ounces.
Alcohol, 95 per cent., sp. g. 820	6 ounces.
Gun-cotton	80 grains.

Mix these in the order above given, and shake them thoroughly, when the cotton will be seen to dissolve, and the substance to assume a glutinous appearance on the inner surface of the bottle. In some instances it may require the addition of more gun-cotton to render the collodion of the required consistency. This can be ascertained by pouring a small quantity upon a piece of glass, and allowing the ether to evaporate. If a thick film is

formed on the glass sufficient to hold together, and to be raised up without breaking very readily, it will answer; but if it does not contain these requisites, add more gun-cotton. If too thick, then add more ether and alcohol, in the same relative proportions.

Allow this to stand a few hours to settle, then decant into another bottle, leaving a small portion at the bottom, which will remain undissolved by the ether and alcohol. This sediment may be reserved until the next lot is required, and added to it without loss.

TO IODIZE THE COLLODION FOR AMBROTYPES.

Pure collodion, ...	8 ounces.
Bromo-iodide of silver, . . .	4 drachms.

Prepared as described on page 179.

Hydro-bromic acid, ...	20 drops.

Prepared as described on page 181.

The iodizing of the collodion is also liable to a variety of uncertainties in the result. If there is any defect in the quality of the ether or the alcohol, the collodion will not work with good results. This can only be known on trial. If the film should not prove thick enough on using, add 20

grains of iodide of potassium and 10 grains of bromide of potassium, as follows: First dissolve the bromide in a drachm or two of water, then add the iodide. When both are well dissolved, add the whole to the eight ounces; shake it well, and allow it to stand for a few days. It will assume at first a thick and opaque appearance, but will settle clear, if left in quiet for a sufficient length of time for all the precipitate to fall. It can then be decanted into another bottle, ready for use.

The remainder of the collodion recipes, together with the preparations of the iodides and bromides, and the various saturated solutions, will be given in a separate chapter.

Collodion should be kept as much as possible from the light, although by some it is asserted that light does not affect its properties. Yet it must be apparent that if the collodion is affected by light in any form, it will certainly be if exposed to its rays for a long time. In no case should it be shaken after it is decanted.

The most successful manner of using collodion is to be provided with three long bottles made expressly for this purpose. Fill each one from the large bottle, allowing them to stand. Use from

each bottle, alternately. By this means there can be no possibility of disturbing the particles in the collodion, and one will also avoid many spots and lines upon the glass plates.

Collodion requires to be perfectly clear and transparent in order to work successfully. The color may at times vary. On first mixing the ingredients, it will assume a yellow hue, changing to a darker shade, and finally to a red. The color does not in any degree affect the working properties of the collodion.

The tests of good collodion before working are, that it appears clear and transparent, devoid of small particles floating in it; that it be thick enough to form a film readily on the glass, and that it dries with perfect smoothness, without ridges or lines.

But the best test is to make a trial picture with it, and the result will soon convince one of the success or failure of his production.

TO REMOVE THE COLOR FROM COLLODION.

It may sometimes be necessary to remove the reddish color which is so often seen in Ambrotype collodion. In order to do this there can be added a few strips of zinc, or, what is more expeditious,

add three or four ounces of pure mercury, and shake it well for a few moments, when the whole will assume a beautiful yellow color.

The mercury will subside, and the collodion may be poured off clear and transparent.

CHAPTER XIII.

COLORING AMBROTYPES—COLORS EMPLOYED—AMBROTYPES FOR LOCKETS—TAKING VIEWS—COPYING DAGUERREOTYPES BY THE AMBROTYPE PROCESS—COPYING ENGRAVINGS, STATUARY, MACHINERY, ETC.

The propriety of coloring the Ambrotype pictures has been questioned by many, and we may even doubt if they are improved by it; but many persons desire to see themselves in their *natural colors*. The artist is therefore compelled to devise some plan of gratifying the public taste, and color his pictures true to life.

Many attempts have been made to color Ambrotypes, and seal them with the single glass, with the colors to be seen, but this plan has been found impracticable, except in a certain degree. The colors may be seen through the glass if they are very deeply colored.

The black varnish removes nearly all color, even when it is placed over the white varnish, and the

opacity of the collodion is such, also, that the colors themselves cannot be seen through the glass but very slightly, even before the black varnish is applied. The only feasible plan of applying the colors is on the collodion, blackening the reverse side of the glass. The colors are applied to the collodion after it is thoroughly dried, in the same manner as in the Daguerreotype; but it is necessary to color much more intensely, in order that the application of the white varnish may not remove all the color, as it invariably will a portion of it. After the white varnish is applied and dried, the picture can then be colored still more highly, if necessary, until the desired tint is acquired.

The colors which are best adapted for this purpose are not those commonly used for Daguerreotypes. The following are those which can be applied with the greatest facility, viz.:

Chinese Vermillion.
Chrome green.
Chrome yellow.
Chinese blue.
Purple, a mixture of venetian red and blue.

The carmine used in the Daguerreotype will not adhere well to the Ambrotype, and the substitu-

tion of vermillion has been found to work exceedingly well, and to render the flesh color quite as natural as in the use of the carmine for the Daguerreotype.

The coloring of jewelry, &c., with moistened gold colors can be adapted to the collodion. With some improvement it will not be affected by the black varnish. The gilding is seen distinctly on either side of the picture; yet by some it is considered as being too conspicuous, and therefore discarded.

The application of most varnishes to the pictures after they are colored has a tendency to darken the whole of the light and shades. It will therefore be necessary to make the impression rather lighter than it is desired to have it when finished.

Many operators put up their portraits after coloring, without applying the white varnish over the collodion, merely blackening the reverse side with black varnish.

It is not to be supposed that they are so durable, because the silver is liable, after a lapse of time, to become affected by the atmosphere, and it must necessarily change. All collodion pictures are of course much better protected by the application of varnish.

It frequently happens that the high lights on the hair of many Ambrotype portraits are too apparent, producing what is termed gray hair. This may be removed by a simple process, as follows:

Prepare some fine lampblack by holding a small piece of glass over an ordinary lamp. A black deposit will be formed of the finest lampblack. This can always be in readiness to darken the high lights; which is effected by a wet brush, with a small portion of this lampblack laid on where a darker shade is required.

AMBROTYPES FOR LOCKETS.

Portraits taken for lockets, breastpins, and medallions, by the Daguerreotype process, are easily inserted, but when taken on glass they are attended with much more difficulty.

A new and very useful invention has been made of a kind of plate, well adapted for locket pictures. They are known as the Melainotype plates, and are now employed by most operators for these kinds of pictures. Being composed of thin plates of iron, and japanned, they require no application of the black varnish, and can be cut and fitted into lockets with the same facility as Daguerreotypes.

Prepared paper is used by some operators for

these kinds of pictures, and patent-leather has been adopted by some. The process of taking them on patent-leather is given on page 155.

All these various materials can be purchased of the dealers in photographic materials.

FOR TRANSFERRING AMBROTYPES TO PAPER.

Gum-shellac	$1\frac{1}{2}$ ounce.
Borax	$\frac{1}{2}$ ounce.
Alcohol	4 ounces.

Dissolve the borax in the alcohol and add the shellac, which will require a slight degree of heat.

Use the black-glazed paper, cut a little larger than the glass on which the Ambrotype is taken. Pour a portion of this solution on the paper, and allow it to partially dry; then lay it over the Ambrotype, which must be well dried; and place the whole under water for five or ten minutes, when the paper can be removed with the picture upon its surface. Dry, and it is ready for use.

TAKING VIEWS BY THE AMBROTYPE PROCESS.

This is the most simple and easy process known in the art, because operators are always sure of a good light. The utility of it for taking views over that of the ordinary Daguerreotype will not be questioned when it is known that all objects are

taken without reversing, and that, too, without the use of a reflector. The camera must be used with a small opening diaphragm, in order to reduce the light, and render the half tints discernible. The bath must be removed to some place near the object to be taken, because the plate will not be sensitive only as long as moisture remains on its surface. If many minutes should elapse after the impression is taken, it will be necessary to plunge the plate into the nitrate bath for a few seconds before applying the developer. It will then cause the picture to appear, even if it had been partially dried on its surface. As little time as possible should intervene after the impression is given before the developer is applied. All views must be sealed up with the black varnish applied to the collodion, otherwise they would appear reversed.

COPYING DAGUERREOTYPES BY THE AMBROTYPE PROCESS.

The durability of the Daguerreotype has long been doubted, yet many persons possess them which are in a good state of preservation, although taken ten or fifteen years ago.

But this new process of positive photographs on glass possesses advantages over the Daguerreotype

that will command the preference on the score of durability. As this fact becomes more generally known, all those persons who possess a Daguerreotype of a departed friend, will hasten to the Ambrotype artist, and have it reproduced with all the durability which this art possesses. Unfortunately, however, many Daguerreotypes cannot be copied as well by the Ambrotype process, in consequence of the dark background generally adopted, the Ambrotype requiring a white background in order to copy successfully. This difficulty can be overcome in a great degree, and the Ambrotype copy produced with a light background, having all the beautiful effects so much desired in this art.

The original Daguerreotype must be first copied in the usual manner, with the black background apparent, of course, then dried, and the figure only blackened over on the reverse side, when a white piece of paper or pasteboard must be placed behind the glass, and a second copy taken with the white background apparent. The second copy will of course be taken, possessing all requisites of a good Ambrotype.

Many Daguerreotypes can be improved by this process, especially in the appearance of the background. The necessity of a double copy is re-

quired to produce the Ambrotype effect, or the first copy may be sealed with only the white paper inserted for a background. Yet the effect is not so pleasing, nor is it so durable.

COPYING ENGRAVINGS, STATUARY, MACHINERY, ETC.

Copying engravings is a very simple process, as the surface is always even, and the objects easily arranged in a favorable light. A small opening diaphragm can be used, which will render the copy very distinct in its details, actually beautifying the engraving itself.

In copying statuary, it will be necessary to have a darker background than the plain white one so often used; yet it need not be entirely black—a dark blue or brown color will answer. One having a lighter centre, and darkened at the sides, would produce a pleasing effect.

In copying models of machinery, this process is of an incalculable utility, as it can be readily seen. The exact counterpart can be produced with a perfect perspective, and no reversal of the object copied.

CHAPTER XIV.

ON THE MANNER OF ARRANGING THE LIGHT—THE FALLING OF THE SAME ON THE DRAPERY—USE OF A DIAPHRAGM—LIGHT ON THE EYES—USING SCREENS—BACKGROUNDS—REFLECTORS—DIAPHRAGM—TIME IN THE CAMERA—OVER-EXPOSURE, AND UNDER-DEVELOPING—TAKING CHILDREN'S PORTRAITS.

The proper adjustment of light for Ambrotypes is a subject which demands the utmost care, and is one which is of great importance to good success in photography. It has been found, of course, that a skylight is much more to be preferred than any side-light, although a very high side-light will answer for the purpose. A skylight that is not more than ten or fifteen feet from the sitter in the highest point, and falling over in such a manner that the lowest portion of it shall be five feet from the floor, has been found to work well. It is absolutely requisite that there should be a good volume of light on the drapery. This must be

seen in the camera, for unless this is attained, the drapery will appear undefined.

By using a diaphragm with a small opening, the light becomes rather more diffused—hence the middle tints and the gradations of light and shade are more clearly seen, as well as a more perfect outline and sharpness. In consequence of the great sensitiveness in Ambrotyping, a diaphragm can be used more frequently than in the Daguerreotype process. Of course in a weak light it cannot be adopted, neither can it be used when children are the subjects.

ON SCREENS AND BACKGROUNDS.

There are three colored screens needed in an ordinary skylight—viz., blue, white, and black—the blue to be used, in connection with the white, at the side of the face, to modify the intense white that may sometimes fall on the eye; the black screen to be placed between the sitter, and at a considerable distance from him and the lower portion of the skylight, to cut off the large light that sometimes falls on the eyes.

This light on the eyes is a very important feature in producing good pictures, and it is one which is often neglected. Without a round, dis-

tinct light falling upon each eye, resembling a small *pin-head*, there can be no perfect picture produced. It will therefore be necessary to so alter and arrange the screens, and the position of the sitter, as to fulfil all these conditions before the impression is given.

The background for Ambrotypes which has come into general use is the white one, because the effect is found to be more pleasing when finished up with the black varnish. The intense white is not so apparent after the picture is finished. It assumes a much darker hue, resembling more nearly the neutral tint of the artist. If the film of the collodion is thin, the background will appear still darker.

The background should be made of strong cotton cloth, stretched on a frame of a size sufficient to be taken in the camera, without showing either side when taking groups.

An improvement can easily be made by coloring or whitewashing it with pure whiting mixed with water, in which a small quantity of glue has been dissolved. Two coats of this whitewash will render it a perfectly dead surface, which is better adapted for the purpose than plain cotton cloth, although many operators use only the white cotton

cloth well bleached. As much distance as possible behind the sitter is recommended; even five or six feet, when it can be attained, will produce the best effects.

Other backgrounds than white are frequently employed. Blue, brown, and a light yellow produce very excellent impressions, if a good distance is obtained, and a strong light falls on it at the same time.

The light being well adjusted, and a good *focus* obtained as well as position, the time necessary for the exposure of the plate will of course vary according to the many conditions under which it is taken. The time will be entirely a matter of experiment, but it has been found by all successful ambrotypers that an over-exposure in the camera, combined with a short time in developing, will produce the most satisfactory results. The pictures will assume a much more desirable tone. The drapery will be well defined, and the general effect much improved by pursuing this course. It is only when children are to be taken that operators can develop slowly. The rule to be observed in children's portraits is, to sit as long as they will without moving, then develop until the picture appears. The tone is never so desirable

but the likeness will be there, which is often prized by the parents more than the most splendid productions of the artist.

In developing, it may sometimes become necessary to arrest the process on the face, allowing it to continue on the drapery. This can be effected by pouring the water slowly on the face, and gradually extending it over the whole picture. Very frequently beautiful effects can be produced by this means of manipulating.

CHAPTER XV.

ALCOHOLIC SOLUTIONS FOR PREPARING COLLODION—IODIDE OF SILVER SOLUTION—BROMIDE OF SILVER SOLUTION—BROMO-IODIDE OF SILVER SOLUTION—SATURATED SOLUTION OF IODIDE OF POTASSIUM IN ALCOHOL—OF BROMIDE OF POTASSIUM—TO MAKE HYDRO-BROMIC ACID.

THE references made in a former portion of this work to the manufacture of collodion will now be given.

All the recipes here presented are highly recommended. All these collodions will work, and work well, if the proper nitrate baths are used in connection with them. But it may be found that many of them will fail at the first trial, yet if a different modification of the bath is adopted, they will work successfully.

The general rule laid down by the most experienced photographers is, that if a collodion is heavily iodized, it will require a larger quantity of silver in the nitrate bath, and, *vice versa*, a

lightly iodized collodion will work with a bath of a less quantity of silver.

The formula given in the chapter on manipulating, page 180, is one which is said to be used by Rehn, of Philadelphia. It certainly will produce very pleasing effects, and if care is had in compounding, it cannot fail of absolute success.

The preparation of all collodions, however, is unavoidably attended with diverse results, from the great liability of some one of the ingredients being of an inferior quality. Nor can one be fully assured of success until the collodion is made and allowed to settle two or three days, and a trial had of the same.

This will necessarily consume much time, and also cause disappointment. It is therefore suggested that, when convenient, the collodion which has already been tested by an experienced operator and maker should be used.

Here follow the various recipes for collodions, and the baths which are necessary to accompany them.

Rehn's celebrated Recipe for Ambrotype Collodion.

No. 1.	Collodion	8 ounces.
	Iodide of silver	4 drachms.
	Hydro-bromic acid . . .	20 drops.

This collodion requires 40 grains of nitrate of silver to the ounce, with the usual developer.

No. 2.	Collodion	8 ounces.
	Bromo-iodide of silver . .	6 drachms.
	Hydro-bromic acid . . .	25 drops

Bath of 40 grains to the ounce.

Cutting's celebrated Patent Recipe for Ambrotype Collodion.

No. 3.	Collodion	1 ounce.
	Gum camphor	1 grain.
	Iodide of potassium . . .	5 grains.

30-grain nitrate bath.

No. 4.	Collodion	6 ounces.
	Iodide of potassium . . .	25 grains.
	Iodide of silver solution . .	2 drachms
	Iodide of ammonia . . .	5 grains.
	Iodine, pure	1 grain.

30-grain nitrate bath.

No. 5.	Collodion	17 ounces.
	Iodide of potassium . . .	40 grains.
	Bromide of potassium . .	40 grains.

Nitrate bath 30 grains to the ounce of water.

No. 6.	Collodion	4 ounces.
	Iodide of potassium . . .	12 grains.
	Bromide of potassium . . .	15 grains.
	Saturated solution of iodide of potassium in alcohol	20 drops.

Nitrate bath of 30 grains.

No. 7.	Collodion	6 ounces.
	Iodide of silver solution . .	1 drachm.
	Hydro-bromic acid . . .	18 drops.
	Bromide of potassium . . .	5 grains.
	Iodide of potassium . . .	15 grains.
	Saturated solution of iodide of potassium in alcohol	$2\frac{1}{2}$ drachms.

40 grains in the nitrate bath.

Very sensitive Collodion for Children.

No. 8.	Collodion	8 ounces.
	Iodide of ammonia . . .	40 grains.
	Bromide of ammonia . . .	16 grains.

40 or 50 grain bath.

ALCOHOLIC SOLUTIONS FOR PREPARING COLLODION.

These solutions are to be prepared and allowed to remain several hours before using, and kept excluded from the light. When they are added to the collodion, they must always be perfectly clear and transparent, nor must any portion of the precipitate which is seen at the bottom of the preparation fall into the collodion.

It is recommended to prepare all these solutions some days even before they are needed, in order that the alcohol and potassium shall dissolve a greater proportion of the iodides or bromides of silver. The greater the proportion of silver taken

up, the better chemical effect will be produced in the collodion. These various preparations are the most difficult portion to be made in manufacturing the collodion, and require the greatest care and attention.

IODIDE OF SILVER SOLUTION.

Dissolve 80 grains of iodide of potassium in 4 ounces of water, and 120 grains of nitrate of silver in the same quantity, but in a separate bottle. (This process must not be conducted in a strong daylight, but in one greatly subdued, or in a dark room by the light of a lamp.) Then pour them together in a large graduated dish, or an open glass vessel, when a yellow precipitate will be formed. This is pure iodide of silver. Wash this precipitate with water three times, allowing it to settle a few minutes, and decant or pour the water off. Then wash it with alcohol twice, to displace the water, pouring it off, and leaving the iodide of silver in the dish. This must now be placed in a glass-stoppered bottle that will hold ten or twelve ounces. Dissolve the iodide of silver in eight ounces of alcohol, 80 per cent., in which has been saturated one ounce of iodide of potassium, as follows:

Pulverize the ounce of iodide of potassium in a clean porcelain mortar, and add one or two ounces of alcohol from the eight ounces which is to be measured out for the iodide of silver solvent. Stir with a pestle the alcohol in the potassium, and a small portion will be taken up or dissolved. This must now be poured into the bottle which contains the washed iodide of silver. Then proceed in the same manner, adding two ounces more of the alcohol, stirring it well, and pouring into the bottle as much as will dissolve, until the whole eight ounces are added. There may be a portion of the iodide of potassium in the mortar not dissolved; this can also be added to the iodide of silver. After shaking it, allow it to stand and settle perfectly clear, when it will be ready for use.

BROMIDE OF SILVER SOLUTION.

Bromide of potassium . . .	80 grains.
Nitrate of silver	80 grains.

Dissolve separately in four ounces of water; then mix it, when the bromide of silver is formed, and is seen in a precipitate at the bottom of the dish. Wash this precipitate with water three times, allowing it to settle a few minutes, and decant or pour the water off. Then wash it with

alcohol twice, to displace the water, pouring it off, leaving the bromide of silver in the dish. This must now be placed in a glass-stoppered bottle that will hold ten or twelve ounces. Dissolve the bromide of silver in eight ounces of alcohol, 80 per cent., in which has been saturated one ounce of bromide of potassium.

Pulverize the ounce of bromide of potassium in a clean porcelain mortar, and add one or two ounces of alcohol from the eight ounces which are to be measured out for the bromide of silver solvent. With the pestle stir the alcohol in the potassium, and a small portion will be taken up or dissolved. This must now be poured into the bottle which contains the washed bromide of silver. Then proceed in the same manner, adding two ounces more of the alcohol, stirring it well, and pouring into the bottle as much as will dissolve, until the whole eight ounces are added.

BROMO-IODIDE OF SILVER SOLUTION.

Dissolve separately in four ounces of water—

Bromide of potassium . . .	80 grains.
Nitrate of silver	80 grains.

Then mix and wash out with water three times, and with alcohol twice. Then pulverize one ounce

of iodide of potassium, and dissolve in eight ounces of alcohol, precisely in the same manner as described in the alcoholic solution of iodide of silver.

These various solutions of silver, and iodides and bromides, are deemed very essential to success in ambrotyping. If they are prepared with care and attention, none can fail of success in making good collodion.

They should be kept as much from the light as possible, and always in glass-stoppered bottles well filled, to prevent evaporation.

SATURATED SOLUTION OF IODIDE OF POTASSIUM IN ALCOHOL.

Pulverize one ounce of iodide of potassium in a mortar, and add three ounces of 80 per cent. alcohol, stirring it for some minutes, and then allowing it to settle. Pour off the clear liquid into a bottle, and add a smaller quantity of alcohol, stirring this also in the same manner, and pouring off the clear solution into the bottle. Continue to add each time a smaller quantity of alcohol, until all the potassium is dissolved.

SATURATED SOLUTION OF BROMIDE OF POTASSIUM IN ALCOHOL.

Pulverize one ounce of bromide of potassium in a mortar, as described in the preparation of iodide of potassium above, adding alcohol, 80 per cent., in the same manner, until it is all dissolved.

These saturated solutions will be found very useful to add to collodions that will not work well, or if the film is not of sufficient thickness on withdrawal from the bath. By adding a small quantity of each of these saturated solutions, any desired effect can be produced.

They also enter in the properties of some of the collodion recipes given in this work.

The quantity of each saturated solution used, is for bromide of potassium just one half as much as of the iodide of potassium—that is to say, if one drachm of iodide is used, one half drachm of the bromide would be sufficient.

TO MAKE THE HYDRO-BROMIC ACID.

Alcohol (95 per cent.) . . .	4 ounces.
Water (distilled)	1 ounce.

To this is added one drachm of pure bromine,—then shaken quickly, and allowed to remain for

twenty-four hours. It will assume at first a deep cherry-red color, but afterwards it will become clear again. Every twenty-four hours there must be added, say, five or six drops more of bromine, and continued for a week or ten days, adding a few drops every day, when it will be ready for use. It will eventually assume nearly a white transparent color, slightly inclined to yellow.

This preparation is highly sensitive to light, and must be kept in a perfectly air-tight bottle, and not exposed to the light of day.

CHAPTER XVI.

CAUTIONS WITH REGARD TO USING THE VARIOUS CHEMICAL SUBSTANCES IN MAKING GUN-COTTON—USE OF ETHER AND ALCOHOL—USE OF CYANIDE OF POTASSIUM—NITRATE OF SILVER—CLEANING THE HANDS—SOLUTION FOR CLEANING THE HANDS—HINTS ON THE VARIOUS PROCESSES CONNECTED WITH POSITIVES AND NEGATIVES.

In the practice of the photographic art, great caution is necessary to be observed in regard to the various chemicals employed.

By a singular coincidence of circumstances, very many of the chemicals are combustible, and are indeed of a very explosive nature, while those which are not inflammable are poisonous. It will therefore be the wish of every operator to avoid accidents, as they are always liable to occur unless they are carefully guarded against.

In preparing gun-cotton, the vapors arising from the combination of the acid and nitrate of potash

are very deleterious, if inhaled, as they are liable to be, because it is necessary to stir the cotton during the whole time of immersion. Always prepare it in the open air, or where a free circulation of it may be obtained.

When the cotton is drying, avoid any contact of fire, or an approach to the fire, for it explodes at the temperature of 370° Fahrenheit, while gunpowder requires 500°. If gun-cotton is kept a long time in large quantities, spontaneous combustion may ensue, if any moisture comes in contact with it.

In using ether and alcohol, be careful to remove the lamp to a great distance from it. In pouring the collodion on the plate, one is very liable to accident, for the vapors of ether are rapidly passing off. They will ignite even if the lamp is within one or two feet of the bottle. Coat the plates by the light of day, if possible, thereby avoiding the possibility of combustion of the collodion.

In pouring ether or collodion from one bottle to another, practice the greatest care, as the vapors will ignite at a long distance from these substances, when they are made to evaporate.

Cyanide of potassium will have the effect of a virulent poison, if taken in the system; and even

inhaling the fumes which constantly arise from it are injurious. By wetting the lips slightly with alcohol immediately afterwards, it will in some degree neutralize the unpleasant effects.

Use no soap to remove the stains of nitrate of silver, but employ cyanide of potassium, which must be well washed with clean water to remove any traces of that substance. Should the skin be broken, a small quantity of cyanide will enter, causing considerable pain and inconvenience.

Avoid the contact of the hands as much as possible with the nitrate of silver solution, as well as dropping it upon the clothes. Wherever it may fall, it will cause a stain or mark that nothing but cyanide of potassium will remove.

TO CLEAN THE HANDS.

The most effectual way to clean the fingers when they become stained with nitrate of silver, is to moisten them and rub them with cyanide of potassium. This should be used as soon as possible after the stains have been made.

A piece of pumice-stone rubbed down to a flat surface is also very effectual in removing fresh stains.

ANOTHER PLAN.

Wash the hands with a solution of iodine, dissolved in alcohol, and while they are wet wash with a strong solution of hyposulphite of soda, afterwards with water, to remove all traces of the salt.

METHOD OF REMOVING THE STAINS OF SILVER FROM LINEN, THE HANDS, ETC.

Mix together—

Common alcohol	20 parts.
Iodine	1 part.
Nitric acid	1 part.
Hydrochloric acid	1 part.

These produce a reddish liquid, which, when applied to stains caused by any salts of silver, immediately converts them into chloride and iodide of silver, soluble in hyposulphite of soda and cyanide of potassium. The effect is especially marked on stained linen. When a black patch is touched with the liquid, by means of a little brush, it instantly turns yellow, with a violet border, if the linen has been starched. On washing with the hyposulphite, or with the cyanide, the violet tint immediately vanishes, and the yellow spot by de-

grees. It is well to wash the stained place after the application of the iodized solution, in order to remove the acids, which might produce independent stains by contact with the hyposulphite or the cyanide.

For the hands, the operation is the same, except that, instead of using a brush, the skin may be rubbed with a piece of rag or cotton.

HINTS AND SUGGESTIONS.

The following hints and suggestions in regard to the practice may be observed with profit:

Always keep the stoppers in the bottle, except when the bottle is in actual use.

Always cover the nitrate of silver bath, except when in use.

Always rinse the fingers well in clean water after developing a picture, or the next will probably be injured.

The frames for holding the glass plates in the plate-holder will require revarnishing, as the nitrate of silver often acts on the wood, and produces stains on the picture.

Frequently wash the glass bottles containing the developing solution.

Be careful that the towels and clothes for clean-

ing the glasses are used for no other purpose, and are free from all contact of soap, &c.

Remove carefully any dried collodion which may form about the neck of the bottle.

Particularly observe that in every thing connected with photography, the most scrupulous attention to cleanliness is indispensable to good success.

Remember to decant from the large bottle a sufficient quantity of collodion every evening for use the following day into several small bottles, as the oftener it is decanted, the more pure the collodion.

If the collodion is too thick, and requires the addition of more ether, the proper time to add it will be when it is decanted. It may then be slightly agitated.

Avoid in all cases the shaking of collodion, or of the varnishes. The collodion is always throwing down a precipitate which requires many hours to fall again, if disturbed; and the varnish will become full of air-bubbles, which on being applied to the surface of the plate, greatly injure it.

In applying the thick varnish, or the balsam, between the two glasses, according to the "patent process," great care must be observed to avoid the

air-bubbles. It should be poured only on the centre of the glass, and then with only a drop or two. After the pouring, the balsam should form a slight line, running to the edge of the glass, otherwise air-bubbles will inevitably be produced. Avoid pressing the glasses after they are sealed.

Use gutta-percha dishes for all photographic purposes, and avoid bringing them too near the fire, as they will melt at a low temperature.

In using test-papers, observe the following precautions: They should be kept in a dark place, and protected from the action of the air, or they soon become purple from carbonic acid, always present in the atmosphere in small quantities. By immersion in water containing about one drop of liquor potasse in four ounces, the blue color is restored.

Test-papers prepared with *porous* paper show the red color better than those upon glazed or strongly sized paper. If the quantity of acid present, however, is small, it is not sufficient in any case simply to dip the paper in the liquid: a small strip should be thrown in, and allowed to remain for ten minutes or a quarter of an hour.

If the paper, on immersion, assumes a wine-red, or purple tint, in place of a decided red, it is prob-

ably caused by carbonic acid gas. In that case the blue color returns when the paper is washed and held to the fire. Blue litmus-paper may be changed to the red papers used for alkalies by soaking in water acidified with sulphuric acid, one drop to half a pint.

TO RENDER ANY COLLODION HIGHLY SENSITIVE.

By the addition of two or three drops of a solution of iodide of iron in alcohol to every ounce of iodized collodion, it will cause it to make the impression in the camera in an incredible short space of time; but as it soon injures the quality of the collodion, it is well not to sensitize only as much as is wanted for immediate use.

PART III.

PRACTICAL DETAILS

OF THE

CARTES DE VISITE PROCESS.

CARTES DE VISITE

AND

STEREOSCOPIC PICTURES.

CHAPTER XVII.

THE DISCOVERY OF THE STEREOSCOPE—THE ORIGINAL DISCOVERER—THE PRINCIPLE OF THE STEREOSCOPE—THE PHILOSOPHY OF THE STEREOSCOPE—UTILITY OF THE STEREOSCOPE—CONDITIONS NECESSARY FOR THE PRODUCTION OF THE STEREOSCOPIC PICTURE—THEY CANNOT BE TAKEN FROM PAINTINGS OR DRAWINGS, BUT FROM STATUARY AND ALL NATURAL OBJECTS.

The discovery of the Stereoscope would never have been made if Photography had not been ushered into this world by such minds as Daguerre, Talbot, Archer and others, who were instrumental in perfecting this wonderful Art. Although two drawings can be made of one object, yet the perfection of the stereoscopic effect is not so great as if they are made by the photographic process. Certain diagrams have been made of ovals and cubes, which were admired as curious drawings, but they have all given place now to those made by the light of the sun.

The invention was due mainly to the researches of Prof. Wheatstone, of King's College, London, who was instituting certain experiments with a view to explain the phenomena of vision, when the idea occurred to him of looking at two pictures of the same object with both eyes, at the same time separating the view of each eye.

The original Stereoscope, as first introduced by Prof. Wheatstone, consisted of two parallel mirrors, so placed that their edges should be in contact, and inclined at right angles, one to the other. These mirrors were attached to a vertical support with slides into the centre of a base-board. Near the two ends of the base-board, were supports for receiving the pictures, which were so placed that they should face each other. Then by looking into the two mirrors at the same time, the images of the two pictures were formed on the same portion of the retina of the eye, conveying to the mind an impression of an object in relief.

This form of the Stereoscope was found useful only for large pictures, and has been superseded by the lenses, made in a certain form for viewing the smaller stereoscopic pictures which were invented by Sir David Brewster.

A large instrument for viewing stereoscopic pictures, was made by Messrs. Southworth & Hawes, of Boston, Mass., and exhibited at a Fair in that city, which was constructed with mirrors, upon the plan of Prof. Wheatstone.

This elicited much attention from the scientific gentlemen who saw it, yet it never has been brought into notice, mainly from the fact of the great cost of construction.

But when the Stereoscopic branch of the Photographic Art shall become enlarged, and the public demand larger pictures, this mode of construction may be adopted. For viewing the ordinary sized Stereoscopic pictures, the Refracting Stereoscope instrument is used, as constructed by Sir David Brewster. This popular instrument, now so generally in use, consists mainly of a pyramidal body of wood, or any other substance, about five and one-half inches high, surmounted by two eye-pieces or half-lenses, separated from each other a distance equal to the space between the two eyes, generally about two and one-half inches.

The body of the instrument is pierced near the base, to form a receptacle for the pictures to be viewed. A small door is usually arranged in

front, to allow light to fall on opaque pictures, and a ground glass is fitted at the end to view the transparent one.

Now, if we take two correct drawings of any object, from two different points of view, and place them in the Stereoscope instrument, we shall find on looking through the lenses, that the two plane representations within will appear united, forming one solid picture of the most perfect description, and if they are properly taken, with a view to produce the most perfect Stereoscopic effect, they will appear to the observer as an actual reality, a solidity. As the name Stereoscope indicates, they become solid pictures.

But this truly wonderful result cannot be obtained unless the drawings are exact copies of nature, even more exact than the human hand can execute. We are therefore obliged to call in the aid of Photography, without which Stereoscope pictures would have never attained that perfection which we see now exhibited.

This art enables us to obtain with great facility the most truthful pictures, more correct in detail, and perfect in light and shade, than by any other known process.

The rapid stride this Art has made in the few

years it has been practised, renders it certain that it will yet attain to a greater degree of excellence, and surpass in wonder any previous revelations of Photographic skill.

The philosophy of the Stereoscope has been explained as the true philosophy of vision; that as we view all objects through the medium of two eyes, the two impressions are made upon the retinæ of the two eyes, precisely in the same manner as the Stereoscopic impression is made by the camera-obscura. Each eye has a distinct reflection of all objects brought within its view, and there is no doubt of the fact, that there are represented the two pictures, as accurately as seen in the Stereoscopic production; and the reason we do not see the two distinctly, is only because the mind has become accustomed to resolving the two into one. This is called binocular vision, or seeing two objects at once with the two eyes.

The utility of the Stereoscope will not be questioned when we bear in mind the wonders it reveals in bringing to our view all the objects of interest in the known world. And it may be applied with a great degree of usefulness, in the delineations of machinery, models, &c., in which field it has not thus far greatly progressed. But

the extent of its usefulness has hardly begun to be appreciated. There are yet many ways in which this art may be applied, which have not even suggested themselves to the minds of Photographers. Like all new wonders in science, it will lead on, step by step, until it will at last mount the topmost round in the ladder of research and investigation.

Two important conditions are necessary for the production of good Stereoscopic pictures: First the distances apart at which the two pictures should be taken to produce the necessary Stereoscopic effect; and secondly, the accessories to be introduced to improve the pictures when groups are to be represented.

If the lenses of the camera are not wide enough apart, the objects will appear wanting in their solidity; and if on the contrary the lenses are placed too far apart, the effect will be exaggerated, and pictures will be produced more resembling monstrosities than any thing real.

Prof. Wheatstone, the inventor, has given one foot of separation for every twenty-five feet distance, when taking views. But in portraiture, about $2\frac{1}{2}$ to $2\frac{3}{4}$ inches is all the distance that is required for the two tubes. We can therefore use

one plate for both pictures, and for instantaneous views these alone can be used as well as for groups. But in taking views of scenery, when there are no moving objects, one-half only of the plate may be exposed, and the camera removed the necessary distance, and the other half exposed. This will involve a certain construction of plate-holder for the camera, where only one-half of the plate is exposed at a time. The plate-holder is then closed, and the other half taken.

A single camera may be used for taking Stereoscopic pictures, but in the present state of the art, most operators use the Stereoscopic camera-tubes and camera-boxes, which are made with all the latest improvements demanded by the progress of the art. They comprise two camera-tubes, having the same focal distance and action, and plate-holders to correspond, having slides to produce one or two pictures upon the plate, at the will of the operator. Also an additional arrangement attached, for making six or twelve portraits for visiting-cards and small portraits, all of which are combined in one perfect Stereoscopic camera-box.

Stereoscopic pictures cannot be produced from drawings or paintings, as many have supposed,

but in all cases they must be made from the objects themselves. So that the skill of our great painters cannot be rendered in the Stereoscope by any process now known to the Photographic Art.

CHAPTER XVIII.

APPARATUS NECESSARY FOR THE PRACTICE OF TAKING STEREOSCOPES—THOSE NECESSARY FOR GROUPS—FOR VIEWS, ETC., ETC.—STEREOSCOPIC CAMERA-BOXES IN USING DIAPHRAGMS—BACKGROUNDS FOR STEREOSCOPIC GROUPS—CURTAINS, WINDOWS, ETC.—PRINTING STEREOSCOPIC PICTURES—THE TONING AND FIXING BATHS—WASHING THE PRINTS, ETC., ETC.

The articles necessary for the most successful production of the Stereoscopic pictures, are somewhat varied, and differ very essentially from those required in the production of portraits. Although the process in some respects is similar, yet much of the manipulation is quite different.

The aim of the operator is always to procure an intense negative, clear in its details, sharp and well defined, with perfect gradations of light and shade.

The following apparatus will be required:

A pair of lenses, known as the quarter-size.

A double camera-box, capable of receiving the two sets

of lenses, with a plate-holder of the required size, for Stereoscopic pictures.

A camera-stand, which is capable of being adjusted to any angle, in order to take views, &c.

When views are taken, a large cotton cloth, lined with yellow cloth, so as to be thrown over the head, to make a kind of tent for changing plates from the plate-holder of the camera-box to the darkened plate-box.

A bath for nitrate of silver.

Four flat dishes, either of porcelain or vulcanized india-rubber.

Graduate glass.

Pair of scales and weights.

An actino-hydrometer.

CHEMICALS.

Iodized collodion.
Protosulphate of iron.
Acetic acid, No. 8.
Glacial acetic acid.
Pyrogallic acid.
Hyposulphite of soda.
Stereoscopic glasses, free from spots.
Nitrate of silver bath solution.

When groups are taken, it is always necessary to have certain accessories in the picture, to make up the effect which is desirable, and the various backgrounds are introduced at the end, which will

have the appearance of interior rooms. They may be painted on canvas, of a neutral tint, to represent any landscape or scenery desired, and articles of furniture may be added with great effect, to resemble the interior of a parlor or drawing-room. Groups should always be so arranged, that the pictures should not appear to have been taken so much to produce a likeness, as the general effect of ease and quiet of the household.

It will therefore require some amount of practice and judgment in arranging the groups, to produce the most pleasing effect.

And first, a good degree of light is required, falling from a large skylight, and all parts of the drapery should be well lighted. It is not so necessary to arrange the persons in one line as in ordinary portraiture, but they may arrange in a circle, around a table, one forward of the other. Yet the light should fall upon the faces of all as much as possible, to avoid heavy shades. The lenses of the camera-tubes should have sufficient depth to take pictures, all in focus, at least ten feet. And any set of lenses that do not possess that merit, will not make good Stereoscopic groups. When there are more than three or four persons in one group, it will be almost impossible to pro-

duce all in good light and shade, unless they are al arranged in a straight line, like a group of soldiers which would, of course, not then be a family group.

They should be first taken without any particular reference to light and shade. The negative can be viewed in the Stereoscope box, as a transparent picture, to ascertain if correct in stereoscopic effect, and the effect of light and shade, which a little practice will enable any one of ordinary judgment to determine correctly. If not found to be satisfactory, another group can be taken obviating all the objections of the first, in light and shade and the stereoscopic effect.

Painted backgrounds can be used, which are made to represent interiors; or wall-papers may be arranged on backgrounds, to produce a very pleasing effect. Chairs and tables, and ottomans, can be introduced into the picture, rendering it in effect like the interior of a room, with curtains, mirrors, and draperies of all kinds, usually found in parlors and drawing-rooms.

The effect of groups may be heightened by introducing a stream of light from a window across some portion of the group; or, if possible, allowing a side window to form a portion of the back-

ground, with a small degree of light falling upon or through the window; the window itself being draped with curtains.

A panel background, with a curtain falling over a portion of it, can be made of colored wall-papers, to produce a very pleasing effect.

In taking groups, the most sensitive collodion is recommended, as no head-rests can be used, and the shortest time possible will be necessary to be employed, for fear of a movement of some of the group. A redevelopment of the negative will almost always be required.

The largest open diaphragm must be used to produce the required depth of focus, which can be ascertained only on trial of the instrument.

The printing of Stereoscopic pictures from negatives on albumen paper, is not attended with much difficulty if all the requisites for good prints are at hand. These consist, first, of the best negatives, and the best quality of albumenized paper.

The negatives must possess the following conditions, viz.: clear and sharp in the details, of good intensity, well defined all over the plate nearly to the edge.

The glasses necessary for Stereoscopic negatives,

are known as ¾ white plate-glass. It requires the best quality of glass, free from bubbles and lines, and of ordinary thickness.

The albumenized paper should be made clean and free from spots, and well glazed, or have an appearance of heavy glazing when viewed at an angle of light.

The paper mostly preferred is that which is heavily albumenized. This must be sought after, as the prints owe much of their beauty to a large quantity of albumen on the surface of the paper.

PREPARATION OF THE ALBUMENIZED PAPER.

See page 235.

SILVERING ALBUMEN PAPER.

See page 236.

MOUNTING STEREOSCOPIC PICTURES.

See page 254.

In mounting groups from life, prints must be reversed in position on the cardboard, that is, the one on the right hand must be pasted on the left, and *vice versa.*

CHAPTER XIX.

ON THE PREPARATION OF THE CHEMICALS FOR THE STEREOSCOPIC NEGATIVES—FORMULÆ FOR COLLODION.—DRY COLLODION—INSTANTANEOUS COLLODION—VARIOUS FORMULÆ—PREPARATION OF THE PRESERVATIVE SOLUTION—ITS USE—THE NEW TANNIN PROCESS.

The various chemicals which are used in the art of taking Stereoscopic negatives, are to be made with considerable care.

The most important is the preparation of the collodion.

The preparation of the dry collodion is attended with considerable difficulty, and much trouble has been experienced in its use, owing to the various changes which the plate is subject to in the manipulation.

The dry processes which have been used are, in the main, nearly all the same in action. The preservative substances which are applied to the collodion film, are only for protection. A collodion

must be used that possesses the peculiar property of porousness, or open film, and that which is known as alcoholic collodion is the best; that is, where alcohol is in excess of the ether, and where a portion of aqua-collodion is present in small quantities. If the ammonia does not possess these conditions, it will be liable to wash off on developing, or blister. In order to obtain this quality, a portion of old collodion may be added to the new. The best collodion for the dry process, should always give good intensity when used wet, and it should be iodized in a greater degree than for the ordinary process.

The kind of collodion which may be made expressly for the dry process, may be known as the ammonia collodion, from the presence of ammonia, and is prepared as follows:

Alcohol	8 ounces.
Ether	8 ounces.

Gun-cotton is added until a thick plain collodion is obtained, to which add about 20 drops of strong aqua-ammonia. Let this stand and settle, when it may be added to iodized collodion, which is heavily iodized, according to either of the following formulæ:

Plain collodion	10 ounces.
Iodide of cadmium . . .	80 grains.
Bromide of cadmium . . .	20 grains.

or,

Iodide of ammonia . . .	6 grains.
Bromide of potassium . . .	2 grains.
Plain collodion	1 ounce.

or,

Iodide of potassium . . .	10 grains.
Bromide of ammonia . . .	3 grains.
Plain collodion	1 ounce.

To each of these collodions, add so much of the ammoniacal collodion as will produce a porosity of film, or rather a rottenness, which may be known on trial, as follows: add, say one ounce to every eight of iodized collodion, and if not sufficiently rotten, then add more, until the required effect is produced.

Old collodion generally possesses this necessary quality of rottenness, which is required in the dry process. But the new collodion can be made to possess it, by adding the ammoniacal to the new, as may be required.

The various preservatives for dry collodion plates, are gelatine, albumen, honey, oxymel, sug-

ar, liquorice root, &c. The most useful and practical are gelatine and albumen.

The gelatine preservative is the most simple, and easiest prepared, and indeed the most practical, from the fact of the great simplicity of its preparation, and from its peculiar keeping qualities.

It is prepared as follows: Take about three drachms of the whitest gelatine, either Cooper's or Cox's, and add it to about one quart of boiling water, stirring it gradually until it is thoroughly dissolved, to which add about four ounces of alcohol; then filter through a cotton-filter, and it is ready for use. This must be kept clear and free from dust, by frequent filtering, if necessary. It is also necessary to keep this preservative liquid of the proper consistency. If it is found too thick, which may be known on trial by its blistering when the developer comes in contact with it, it must be reduced with water. And in like manner if too thin, it must be rendered thicker by the addition of more gelatine; or, what is better, add some from another bottle, which has already been prepared too thick for use. This bottle of thick preservative preparation may be as well prepared in the first instance, by doubling the quantity of gelatine.

PREPARATION OF THE DRY COLLODION PLATES.

All glass plates, coated with collodion, on removal from the negative bath, if allowed to dry without any substance over the surface of the collodio-iodide of silver, would be unfit for use, because the nitrate of silver will necessarily crystallize on the surface, and dissolve the iodide of silver, on which the light acts when in its wet state.

The rendering of this plate sensitive to light, after it has become dry, is what is termed the Dry Collodion Process. And it must be effected by producing the following conditions of the plate. To prevent the crystallization of the nitrate of silver—which is done by first washing off very carefully all the free nitrate of silver on its surface, and coating it with a substance which when dried will form another film over the collodio-iodide film first formed—only enough water must be poured on to cover the plate; then flow it over the plate, and if, on draining it off, all greasiness disappears, no more water is needed. But if it still appears to draw up, as though grease were present, then pour enough water additional to

cover the plate, and so on, until by pouring off the water it appears free from grease.

The most useful and practicable of all dry processes, are those with gelatine, heretofore described, and Mr. Fothergill's collodio-albumen process, described on page 218.

After the plate is coated in the usual manner, with the collodion made expressly for the dry collodion process, it may be removed from the bath as soon as the iodide of silver is well formed on its surface; the free nitrate of silver is allowed to run off, when it is carefully washed with pure water, and allowed to dry by placing one corner of the plate upon clean blotting-paper. Before it is entirely dry, the gelatine solution may be poured over its surface, nearly in the same manner as when coating it with collodion.

Washing off the free nitrate of silver from the surface is attended with some difficulty. The water must be poured in from an open-mouthed bottle, very slowly, and only a certain quantity, barely enough to remove the free nitrate of silver. The quantity required can be learned by actual experiment. Of course different size plates will require different quantities of water.

In pouring the preservative liquid upon the

plate, an even coating is very essential, which may be obtained in the same manner as in the use of collodion. Of course all this preparation of the dry plates must be conducted in a darkened room, the same as in the preparation of the wet plate. Daylight, in the smallest degree, is highly injurious.

After the plate is coated with the preservative liquid, it must be placed upon its edge on clean blotting-paper and allowed to dry, or, if convenient, a plate-box may be used which can be gently heated by the spirit-lamp, or placed near the fire.

These plates, if properly prepared, can be used several days or months after such preparation. But they are doubtless more sensitive within a few days after they are dry.

Of course the time of exposure in the camera is greater than by the wet process with the same collodion, generally from four to five times longer, say from five to ten minutes.

The development of the image may be delayed for several days after exposure, and still the image will appear, though it is contended by some operators that many weeks' delay will impair the beauty of the impression. Therefore the first opportunity had better be embraced for bringing

out the latent image, because the sensitiveness of the plate certainly diminishes by delay, and we may reasonably infer the picture itself would be impaired.

DEVELOPMENT OF DRY COLLODION PLATES.

In the development of dry collodion plates, a course must be pursued differing from that adopted with the ordinary wet plates.

The preservative film acts not only to retard the action of the light in the camera, but much more to retard the action of the developer.

The ordinary sulphate of iron developer, has not been found sufficiently vigorous to produce the best results, and pyrogallic acid is used with more marked success.

The plate must first be washed thoroughly with water, until the preservative solution is partially dissolved, then a developing solution, made as follows, must be poured upon its surface, in quantity just enough to cover it:

Pyrogallic acid	8 grains.
Citric acid	5 grains.
Water	6 ounces.

Let this solution remain upon its surface four or five minutes, until the image begins to appear;

then pour off this into a bottle, and add to it two or three drops of nitrate of silver solution (of 50 grains of silver to the ounce of water), or just enough to cover the plate, when the image will appear more clearly. For convenience a levelling stand may be used, constructed of two pieces of glass lying across two small upright strips of wood, raised high enough to allow the lamp to be held under it, in order to watch the progress of the developer.

Should the solution become dark and turbid, pour it off, and add another with the nitrate of silver weakened.

The process may be continued, using first the pyrogallic acid developer and the nitrate of silver added to it alternately, until a requisite intensity is obtained.

This developing process will be obtained much sooner in a moderately warm temperature, cold being highly detrimental to the development of dry collodion plates.

THE GALLIC ACID DEVELOPER.

Gallic acid is used successfully by many who practice the dry process, and is considered in some respects more certain of good results. But

it requires a much longer time to complete the process:

Gallic acid	24 grains.
Citric acid	6 grains.
Water	6 ounces.

To develop with this solution, it is only necessary to wash the plate well with water, and place it in a flat dish, pouring enough of this solution on the bottom to cover it.

To each ounce of this solution must be added twenty or twenty-five drops of nitrate of silver solution, as in the pyrogallic acid developer.

The plate must remain immersed in this preparation for five or six hours, or perhaps longer.

The most feasible plan is, to have a large flat dish, large enough to hold several plates at a time, and they may all be placed in it at once, and allowed to remain; by weakening the solution the plates may remain in all night, and then only be well developed. The plan has been adopted by many who take stereoscopic views by the dry process, to bring all the plates taken during the day, to the developing-room at night. Then to place them all in this gallic acid developer, and allow them to remain till morning, when

they will be found to have attained the required intensity for use.

By graduating the strength of the developer so as to require ten or twelve hours to complete the operation, this will be found the most feasible plan of operating.

There are many difficulties to be met with in the dry collodion process. The film is liable to leave the plate on developing, and it can only be prevented by using in all cases a collodion having great porosity or a rotten film. Yet even then this difficulty will sometimes present itself, which may in some measure be prevented by drawing a small camel's-hair brush dipped in the benzoin or crystal varnish around the edges of the plates after they are dried. This varnish will not be affected by the washing of the developer, and will retain the film upon the plate.

The gun-cotton used for making dry collodion should be made at rather a high temperature, and it may be known, when the fibres appear to break readily in the fingers and to throw down dusty particles of the cotton.

The glasses used must in all cases be scrupulously clean and free from moisture. In cold weather, drying by the fire will greatly facilitate the process.

The preservative substances are so liable to expand and contract, unless they are made of the proper consistency, that attention to this portion of the process is called.

Nevertheless, if good and proper care is used, the dry collodion process may be worked with great success. It has been so worked by many persons who have essayed the delightful task, as it certainly recommends itself above all the wet processes known to the photographic world. Not only from its perfect neatness of action when in the field, but from its freedom from that almost insurmountable burden, of carrying through the woods and fields all those innumerable bottles, liquids, stands, dishes, &c., with which the photographer was encumbered before the dry process was known.

FOTHERGILL'S COLLODIO-ALBUMEN PROCESS.

In this process, as in all other dry collodion processes, it is necessary to use collodion which gives a porous dry film.

The plates are prepared in the ordinary way, the usual precautions of having the glass clean and dry, and allowing the collodion to set well before dipping, being observed. On removal from

the silver solution, wash the plate with a small quantity of distilled water, half an ounce for a stereoscopic plate being sufficient. To do this, the plate is kept by one corner, or put upon a levelling stand, and the water poured lightly on one corner. It is then, by inclining gently, flowed back and forth until all greasiness has disappeared. This will generally take less than a minute. The nitrate of silver is not all washed off by this process, but simply diluted. The water is poured off, the plate is drained, and then is coated with albumen, prepared in the following way:

White of egg	6 ounces.
Distilled water	6 ounces.
Strong aqua-ammonia . . .	1 drachm.

Beat the whole to a perfect froth, let it resume the liquid state again, and filter carefully.

This solution is then poured over the plate at one corner, inclining slightly, so that it covers every part of the film; then flow backward and forward for fifteen or twenty seconds, throw it off, and wash the plate thoroughly under running water, or in several trays of water, then drain it on blotting paper, and set it in the drying box.

A combination takes place between the albu-

men and the silver, forming an insoluble varnish, which may be called albuminate of silver.

The development is conducted in the same way as in the other dry collodion processes.

THE NEW TANNIN PROCESS.

Perhaps the most useful and practicable of all dry collodion processes now known and in use, is the so-called Tannin process.

The fact that the preparation of the plates is attended with much less difficulty, and the expense diminished, will invariably give this process the preference.

The various kinds of collodion will answer the purposes of the tannin process. New collodion is preferred by some, though the porous film will answer. Iodides and bromides, made with alkaline properties, such as ammonia and potassa, are the most useful.

A precaution may be necessary in order to retain the collodion on the plate, by running around the edge of it a narrow line of albumen or varnish.

The plate must be flowed in the usual manner with collodion, and sufficiently dried, then washed carefully, by placing it in a flat dish of pure soft water, changing it until it will show no signs

of greasiness on removal from the dish. It is then laid for three minutes in another dish, containing the tannin solution, prepared as follows:

Tannin	20 grains.
Water	1 ounce; filter.

This solution will answer for quite a large number of plates; the exact number cannot be stated. It can be used again by adding a little alcohol, but new solutions for every new lot of plates are preferable.

The plates are now to be dried in a dark room, of course, and carefully laid away in a box impervious to light.*

Expose the plate in the camera about five or six times longer than the usual time given with the wet process.

In developing, the same plan must be observed as in other dry collodions, first washing the plate with water, when the developer will flow more evenly. The same kind of developer, and the same means of redeveloping, may be used as in the gelatine process, given on page 214.

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* A new kind of dry collodion box, lately brought into use, manufactured by Messrs. John Stock & Co., of New York, is highly recommended for the dry plates.

Wash and fix it with hyposulphite of soda.

The developer most in use is prepared as follows:

Pyrogallic acid . . .	72 grains.
Alcohol	1 ounce; filter.

When wanted for use, add one drachm to one ounce of water, also two or three drops of the following solution, filtered:

Nitrate of silver	20 grains.
Citric acid	50 grains.
Water.	1 ounce.

In developing, should the negative assume a red appearance, it will indicate an over-exposure; then add more silver to the developer, and redevelop a second time. If it is under-exposed, add a few more drops of the pyrogallic solution.

An improvement in the manner of washing the coated plates after they are removed from the nitrate of silver bath, is effected by dipping the plate into a series of baths (six in number), of pure water, allowing them to remain only a few moments in each bath. The first bath will contain a large quantity of silver which may be recovered by precipitation.

CHAPTER XX.

DESCRIPTION OF THE CARTES DE VISITE—ON THE PRACTICE OF THE CARTES DE VISITE—CAMERAS EMPLOYED IN THE CARTES DE VISITE—COLLODION FOR THE NEGATIVES—ON TAKING THE NEGATIVES—REDEVELOPING WITH PYROGALLIC ACID—BICHLORIDE OF MERCURY — THE FIXING BATH FOR NEGATIVES.

The Art of Photography is constantly making changes and new demands upon its votaries, and lately a new feature has developed itself in this country in the call for the portraits known as *Cartes de Visite*, or visiting portraits. Their origin, as we all know, was in Paris, where indeed, it may be said, the Art Photographic was born. Although they have been produced there for several months, if not years, they have never, until very recently, been much in use in the United States.

They are now, however, in great demand in this country, and have become a permanent feature

in the various productions of the photographic artist.

These portraits, as we shall call them—for they are indeed nothing more than full-length miniatures of the human face and form—are generally taken in a standing position, with a landscape background, or one made with panel paper, or a plain background having a small portion of a curtain in view. Some have a pedestal, or a pillar or column represented, with the subject resting the hand gracefully upon the one or the other.

A chair somewhat ornamented, or a portion of a sofa, may be introduced with good effect.

A beautiful feature of these *cartes de visite* is the introduction of a balustrade, which must be painted of a dove color. An urn made of wood, or plaster of Paris, colored the requisite tint, adds much to the beauty of the picture. Any article of furniture which may be used in the drawing-room, would always be in good taste in the card picture.

The background mostly used, and which will produce the best effects, is made by simply pasting panel or figured paper upon a screen or other background. This panel paper can be obtained at any paper-hanging establishment. In regard

to color, a neutral tint of course is preferable. A pillar or column may also be represented in paper, and even the curtain of a window may be judiciously introduced.

The usual stereoscopic camera with two tubes, is the one generally employed for the production of this class of pictures; yet a common quarter or half tube alone will answer the purpose. The advantage of the stereoscopic camera is that, by a new and beautiful arrangement of the box, an operator is enabled to produce four or more of these negatives upon one glass plate, thereby facilitating their rapid production, as persons who desire these pictures generally require more than one copy.

In most cases these portraits are taken in a standing position, and with out-door dresses, overcoats, hats, shawls, &c.; though a beautiful effect is produced not unfrequently in a sitting posture, either in reading or engaged in some other occupation, with other accessories in the picture, as chairs, tables, &c.

A full field of light should fall upon the drapery, and the whole base of the picture should be well illuminated. The background should stand rather nearer the subject than for the ordinary

portrait, in order to bring the figures out in focus as much as possible.

ON THE PRACTICE OF PHOTOGRAPHY IN REGARD TO CARTES DE VISITE.

The production of the Cartes de Visite has become such a feature in all Photographic establishments, that it is well to state what is necessary to be observed in the practice of the art.

The best quality of all the articles used must invariably be employed, and greater care is required in this regard than in any other branch of Photography. For it is conceded that these cartes de visite, when properly made, are indeed the perfection of the art at the present day.

They rival the far-famed Daguereotype in some respects, when they are seen in all their perfection. Sharp and clear in outline, beautiful in tone and softness of finish, and withal so natural in position, giving in fact the whole person in form and expression, and not the mere half-formed image which we formerly viewed.

They are capable of such multiplication, that when we regard their cheapness and their portability, they become truly the *ne plus ultra* of Photography.

They will no doubt endure for a long time, and although they are small, they possess certain peculiarities, not known to larger photographs. Being made small, they are the more correct representations of the camera, for it is well known to all those who practise the art, as you increase the size of the picture you decrease the actual mathematical correctness of the portrait. Hence we find that all the cartes de visite are generally more flattering and pleasing to customers than the larger pictures.

The paper used must be of superior quality, well albumenized, possessing a heavy gloss, white, and free from spots.

The cameras used for the Cartes de Visite must possess great depth of focus, as well as field. Many are now made expressly for this purpose, and we would especially recommend those so constructed. There have been great improvements in the manufacture of the cameras, and those now constructed by C. C. Harrison, and by Holmes, Booth & Haydens, are very extensively used. Being manufactured expressly for the Cartes de Visite, they are indispensable.

The Voigtlander tubes are said to possess the necessary requisites in a great degree, especially

those lately made by this old established house in Vienna. All these cameras are for sale by most of the dealers in Photographic materials.

Cartes de Visite are capable of being copied into larger portraits, though not so readily as the Daguerreotype or the Ambrotype. Yet they may be enlarged to any degree and painted by the artist. Generally, the head only is copied, and that printed in vignette, as it is termed. See page 239.

The position of the person in the Carte de Visite is one perhaps of more consequence than in other Photographs, for where the whole form is seen, there is more liability to err in some point, than where only a portion is taken.

Great care should be taken that a graceful attitude should be preserved, that the hand should rest naturally upon some ornament in the picture, either a pedestal or column, or a chair. The light should fall as much as possible on the drapery, so that it will print clear in all the lights and shadows.

A great amount of judgment will be required to arrange the position, which can only be attained by experience. Cartes de Visite being represented in a standing position, they will of course be seen down to the floor, and that should

have a pleasing pattern of oil-cloth or carpet. The backgrounds generally resting on the carpet, must be arranged so as not to show any space underneath.

COLLODIONS FOR THE NEGATIVES FOR CARTES DE VISITE.

The collodions required for the Cartes de Visite pictures, are the same as required for Stereoscopic pictures.

They are made of the various iodizers, but certain kinds are found to be better adapted for them than for other pictures. What are termed the alkaline iodides, are preferable, viz.: ammonia, potash, &c., though the metallic iodides are used. The alcoholic collodion, or that which has an excess of alcohol over the ether, is preferred, as it more readily gives a porous film, and will evaporate more slowly than that made in the ordinary manner, while its keeping qualities are augmented.

A nitrate bath, in which this collodion is used, will require to be evaporated occasionally, as it invariably absorbs a quantity of the alcohol. This may be effected with a common evaporating dish, and by boiling a short time, the alcohol will be driven off.

The preparation of the nitrate bath, will be found on page 48.

So much depends upon the negative for the production of first class *Cartes de Visite*, that it may be well to remark, unless the negative is made to conform to certain conditions, all the subsequent printing and toning will not produce good results.

Hence the absolute necessity of strictly complying with the following:

The negative must be perfectly sharp in its outlines, of great intensity, and withal possess the clearness in lights and shades so desirable in the finished picture—no matting of the shadows, no over-whiteness of the high-lights. It must possess the peculiarity of great intensity when viewed by transmitted light, and at the same time when viewed as an Ambrotype, to appear like one, in some degree.

Two or three formulæ will be given for the preparation of the alcoholic collodion.

The quality of the alcohol is a very essential point in its future action.

There are various means of preparing what is called the 95 per cent. alcohol, but the most simple and convenient is by adding, say one or two pounds of unslacked lime to a gallon of alcohol,

shaking it occasionally, and the water, if any is present, will be absorbed by the lime; care being observed that it be well corked. Let it remain a few days to settle, and then decant for use.

ALCOHOLIC COLLODION.

Pure alcohol	4 ounces.
Ether	2 ounces.
Iodide of ammonia	20 grains.
Bromide of cadmium . . .	12 grains.
Gun-cotton to render it sufficiently thick for use.	

Dissolve the cotton first in the alcohol and ether, in the usual proportions of three ounces of alcohol and five of ether, reserving of course the alcohol to add afterward. Let it settle, and then decant, when add the iodizers to the remaining portion of alcohol, which will readily dissolve in it, and add the whole to the collodion.

Should the collodion then be too thin, add more gun-cotton; or, if too thick, reduce it by adding the relative proportions of ether and alcohol.

Another formula, as follows:

Plain collodion	10 ounces.
Iodide of ammonia . . .	50 grains.
Bromide of potash . . .	25 grains.

See page 82.

NEGATIVES FOR THE CARTES DE VISITE.

To attain the desired intensity, resort must be had to the redeveloping processes known to the art.

The collodion should possess a sufficient degree of intensity, when developed with the sulphate of iron developer, to produce an ordinary photograph on plain paper.

By referring to page 82, the formulæ for collodions, useful in producing good negatives for the Cartes de Visite portraits, will be found

The redeveloping, by means of pyrogallic acid, is found to produce the most desirable results. It is as follows:

Make a solution of pyrogallic acid and acetic acid, to be kept in readiness for redeveloping.

Pyrogallic acid	30 grains.
Water	8 ounces.
Alcohol	1 ounce.
Glacial acetic acid . . .	1 ounce; filter.

Dissolve the pyrogallic acid in the glacial acetic acid.

Another solution, as follows:

Nitrate of silver	20 grains.
Water	1 ounce; filter.

These solutions to be kept in perfectly clean bottles, and excluded from the light of day.

When the negative is developed with the sulphate of iron developer, and thoroughly washed, then mix about 2 ounces of the pyrogallic acid developer, and 20 drops of the silver solution. And it must be immediately poured upon the plate, of course excluded from the light of day. Moreover, the bottles into which these solutions are mixed, must be scrupulously clean, and they must be cleaned out thoroughly every time a picture is developed.

A number of small bottles may be cleaned before commencing operations in the morning. If the same bottle is used twice without washing, for the redeveloping solutions, there will invariably be lines and streaks produced on the plate. Many operators have entirely failed in consequence of a want of attention to this simple care of cleanliness of the bottle used for these solutions.

Allow the solution to flow evenly and quickly over the plate, then wash off with water, and if a sufficient intensity is not attained, repeat the operation by strengthening the solution with silver; by repeating the operation, any degree of intensity may be obtained.

REDEVELOPING WITH BICHLORIDE OF MERCURY.

Another and oftentimes a useful method of redeveloping, may be adopted with bichloride of mercury, and withal it is more economical. (See page 92.) It is as follows :

After developing with the sulphate of iron solution, and before cleaning with the the hyposulphite of soda, use a solution of bichloride of mercury, which can be made by dissolving one ounce in about four ounces of water. There will be only a small portion of the bichloride dissolved, and this solution must be diluted before being used as a redeveloping agent. The strength required may be known by a trial, and if not strong enough a greater strength may be used. After the negative is fixed, a weak solution of aqua-ammonia can be poured over the surface, and a still greater intensity obtained.

THE FIXING BATH.

Hyposulphite of soda, saturated solution. This bath is made simply by dissolving any quantity of hyposulphite of soda in water, until no more will dissolve.

CHAPTER XXI.

ON THE PREPARATION OF ALBUMEN PAPER—SILVERING THE ALBUMEN PAPER—PRINTING THE ALBUMEN PAPER—CARTES DE VISITE—PRINTING THE VIGNETTE CARTES DE VISITE—TONING ALBUMEN PRINTS—THE ALKALINE TONING BATHS—THE HOT WATER BATH—CHLORIDE OF GOLD, AS A TONING AGENT — IMPERFECTIONS IN TONING ALBUMEN PRINTS—MOUNTING THE CARTES DE VISITE—PRESSING THEM—COLORING THE CARTES DE VISITE.

PREPARATION OF THE ALBUMEN PAPER.

The preparation of the albumen paper, is attended with considerable difficulty, and great care is required in producing the requisite finish ; it is strongly recommended to purchase the article already prepared from the dealers in Photographic materials.

A brief process is hereby given. The whites of ten freshly laid hen's eggs, are to be beaten to a froth, with a beater composed of a glass rod, or any substance not metallic, such as wood, or goose-

quills. (See page 60.) To this must be added a sufficient quantity of soft water, to render the mass limpid, and for every ounce of it, there must be added ten or fifteen grains of hydrochlorate of ammonia. Then filter, and the paper must be laid upon the preparation for five minutes, in a flat dish, in the same manner as in the silvering process; then hung up to dry, in a place secure from dust or any deleterious exposure to chemicals, &c. After it is well dried, each sheet must be submitted to the process of coagulation, either by passing a heated iron over the surface, with a thin paper between, or laying each sheet upon a flat dish, filled with hot water, sufficiently heated to coagulate the albumen.

This whole process is liable to failure, unless after considerable experience. Hence the recommendation to purchase the article already prepared in the market.

SILVERING THE ALBUMEN PAPER.

The silvering of the albumen paper, is a very important part of the process in producing good pictures.

The usual strength of the nitrate of silver is, 90 to 120 grains to the ounce of water. After filter-

ing, float the paper for five minutes, by carefully laying the albumen side upon the silver, avoiding bubbles, which may be done by laying one edge of the paper on the solution first, and allowing it to fall slowly on the surface. Hang it up to dry in a dark room. The silver solution may become slightly colored after using it, when it can be rendered perfectly clear by the addition of a small quantity of pipe-clay, or kaolin, to be purchased at the druggists. Shake the bottle, then filter, and it will assume a clear appearance. The solution must always possess a clear appearance before the paper is silvered. The solution will also be reduced in the strength of the silver, which must be replenished as often as it occurs, in order to keep up the maximum strength to 90 grains to the ounce.

The albumen paper can be silvered and dried for future use, and if kept carefully excluded from the light in a portfolio, may be used for several days after silvering, especially in the winter season. But in warm weather they will become discolored, and unfit for use in a short time.

PRINTING ON ALBUMEN PAPER.

The printing on albumen paper, is easily effected. The process must, however, be carried much further than the ordinary printing on plain paper.

A greater exposure is required, in order to produce the requisite depth of color in the subsequent toning. What is called the bronze color, must be attained. The prints can be laid aside in a portfolio, or a drawer, or box, carefully excluded from the light, and a large number can be washed and toned at one operation.

It has been found by the experience of the best practical operators, that the albumen prints are rendered more beautiful in tone and effect if they are printed in a subdued light, and not in the direct rays of the sun. Thus in a cloudy day, when the process necessarily goes on slower, the effect is improved by a consequent softer tone. Of course those printed in the sun are oftentimes equal to those by a subdued light. The most expeditious mode will be adopted, whilst the demand for these pictures still continues.

PRINTING CARTES DE VISITE AS VIGNETTES.

This is a very pleasing style of Cartes de Visite, and possesses in some degree the peculiarity of a highly finished Daguerreotype.

The head is generally taken larger than when the whole form is to be represented, and a graceful position is very desirable.

The manner of printing the negatives for vignettes, is by placing a raised card-board from one-half to one inch above the glass, in which a hole is cut nearly the shape of an egg. This hole must be rather smaller than the head to be printed. Now this card-board is so arranged, that it can cover all the glass except the hole over the head, of course allowing no light to fall upon the glass, except through this hole. In order to raise the card-board above the negative glass, a frame of wood is to be made, on which to fasten it.

By pasting a piece of white tissue-paper over this oval hole, the light will pass through, and converge around the head, and produce the cloudy appearance so much to be desired. The large portion of the oval hole should be placed so as to cover the shoulders.

Vignettes are usually of a softer tone than when printed full length, and this is owing to the light passing through the tissue-paper.

TONING ALBUMEN PRINTS.—THE ALKALINE BATH.

The alkaline bath for toning albumen prints, has come into such general use, that it is adopted by all the most successful operators. The following is a complete and practical detail of the process.

The toning by this bath attains one great desideratum long sought for in Photography, viz.: a great degree of permanence. None but the independent gold and hyposulphite bath will ever produce durable prints. By toning and fixing separately, we attain the beautiful effect of the gold, without which no beauty can be produced.

When any acid is present in the gold bath, no desirable results can be obtained. Hence we use a strictly neutral bath, rendered so by the addition of some well-known alkaline substance, and bicarbonate of soda is employed.

The old process of gold and hyposulphite combined, as a toning bath, will never succeed in albumen prints. Nor will any bath made with the

ingredients combined, ever supersede the alkaline toning bath given below.

The following solutions are prepared, viz.:

GOLD SOLUTION.

Chloride of gold	15 grains,
Or one bottle of ordinary chloride of gold.	
Water	15 ounces.

Dissolve and filter.

ALKALINE SOLUTION.

Bicarbonate of soda . . .	60 grains.
Water	20 ounces.

Dissolve and filter.

Some operators use the acetate of soda, instead of the bicarbonate. Yet the bicarbonate is the most to be relied upon.

The prints are first well washed in running water for twenty or thirty minutes, when they will assume a red color. Then immerse them for a few moments in a solution of common salt and water, the proportions not material, say:

Water	10 ounces.
Salt	1 ounce.

In first washing the prints, it is well to place them in a small quantity of water, in order to save the superfluous silver. It is therefore recommend-

ed by those who are making a large number of Cartes de Visite, to place those first in a dish expressly reserved for the first washing, as the largest portion of the silver will leave the paper at the first immersion. The water containing the silver washings can be kept in a bottle, and, when desirable, a small quantity of salt introduced, forming chloride of silver. This may be saved upon a filter, and sold to the silver refiners at a good price, thereby yielding oftentimes one-half or one-quarter of the cost of the silver.

Wash carefully, and lay aside in a dish of water, excluded from the light. Prepare all the prints that may be required to tone at one time, in this manner. When desired to tone the prints, mix equal parts of the gold and alkaline solution in a flat porcelain, india-rubber, glass or earthen dish.

The exact quantity cannot be definitely stated, but it may be known when a sufficient quantity of soda is added, by using a small slip of blue litmus paper, which must not be changed to a red color, but just at the point of the change to the red; in other words, there must be added just enough of the soda to neutralize the solution of gold. A few experiments will soon enable any one to learn the quantity required.

Now, by placing one of the prints which have been washed as above, in this solution, and keeping the solution in motion, a change will take place in a few moments, and continue until the required tone is attained.

If on trial of one print, it assumes a grayish or mealy appearance on being held up to transmitted light, then add more of the bicarbonite of soda. A few trials will soon indicate the exact quantity of soda required.

The prints may be placed in this solution separately, or any number at a time. But the surest manner is to place only two or three in at once. After they assume the proper tone and color, they are then to be well washed again in running water for fifteen or twenty minutes. Then they are to be subjected to the fixing process, with a solution of hyposulphite of soda, viz.: of two ounces of hyposulphite to ten ounces of water.

This fixing solution can be used only for a certain number of prints, as it becomes deteriorated by use, when an entirely new solution must be made.

By some operators, however, this hyposulphite solution is filtered, and more of the soda added, and the tone of the prints is not impaired. Yet

those most successful only use the hyposulphite in fresh solutions for each new lot of prints.

In no case must there be any of the gold solution in the hyposulphite, or any of the hyposulphite in the gold. Great care must be observed that none shall be conveyed from one solution to the other. The hands must be well wiped and dried before placing them in either solution. After a clear tone is produced in the hyposulphite solution, which will require fifteen or twenty minutes, or more, the prints require to be well washed again, and hung up to dry.

The prints may change slightly to a reddish color on the first immersion in the hyposulphite, but they will assume a purple black, if continued the proper length of time. This last washing must be thorough and complete.

The prints are now ready for mounting.

The gold solution will tone only a certain quantity of prints. The number may be known when on adding another print, no change takes place. Then a new solution of gold and bicarbonate of soda must be prepared.

THE NITRATE OF URANIUM BATH.*

This toning bath is the best, but like all alkaline baths requires great care in the manipulation. It will produce those beautiful tones of black and white, so desirable in the Cartes de Visite.

Float the albumen paper in a silver solution of 90 grains of silver to each ounce of water; having previously added a few drops of strong aqua-ammonia, to neutralize the acid in the nitrate of silver. Let it settle a few moments, and filter. Prepare three solutions as follows:

No. 1. Chloride of gold . . . 15 grains,
Or one bottle of the ordinary chloride of gold.
Water . . . . . 2 ounces.
Neutralize with bicarbonate of soda.

No. 2. Acetate of soda . . . 100 grains.
Water . . . 1 quart, or 32 ounces.

No. 3. Nitrate of uranium . . 15 grains.
Water . . . . . 2 ounces.
Bicarbonate of soda sufficient to neutralize the acid, which may be known by test-paper.

Mix Nos. 1 and 2 by pouring the gold into the soda. Then add the nitrate of uranium, and filter.

This will tone nearly 200 prints, when a new bath can be prepared, to which this old one may be added, and the tone in most cases improved; but should there be any mealiness, lay aside the whole bath, and prepare a new one, reserving it for future use, and it may be added gradually to the new baths. Always wash the prints well, as in other alkaline baths, and immerse in the above the usual time. On removal from the toning bath, wash carefully, and fix in a solution of hyposulphite.

The foregoing method of toning is now adopted in the most extensive establishments in New York. On trial, it will prove the most practicable, and there is not so much waste of chemicals.

The use of aqua-ammonia in all the silver solutions for the albumen paper, is recommended.

Some difficulties may occur in the use of this bath. When it does not tone quickly, add more gold; it may even require two bottles to the above.

Variations in the proportions of the chemicals of this, and all baths, are sometimes necessary.

Wash carefully through all the various stages, until the final mounting of the picture.

THE NEW TONING BATH FOR ALBUMEN PRINTS.

The following bath possesses some properties not found in other alkaline baths, as it will produce the purple tints approaching the black, so much to be desired.

The working of the print is the same as in other baths: but instead of the last washing in salt and water, use the following:

Liquid ammonia	1 drachm.
Water	16 ounces.

This will remove every trace of the free nitrate of silver, and give it the purple hue; but the action must be carefully watched, and they must not assume a pale-red color, or they will lose their brilliancy in the after-toning.

Wash again in water for a few minutes, then immerse them in a bath prepared as follows:

Chloride of gold	2 grains.
Hyposulphite of Soda . . .	6 grains.

Dissolve each separately in four ounces of water, and mix by pouring the gold into the hyposulphite; after which add ten drops of hydrochloric (muriatic) acid.

This bath will tone rapidly. The prints are to

be printed lighter than for the other baths, and kept in motion in the bath.

The bottle of gold can be dissolved in fifteen drachms of water. Two drachms are poured out for each preparation.

This bath can be used to tone thirty or forty prints, when a new one must be prepared.

After the toning is complete, the fixing is obtained in the following solution :

Hyposulphite of soda . . .	2 ounces.
Water	8 ounces.

The fixing bath can only be used for the fixation of one lot of prints, a new one in all cases to be prepared for the next operation.

With proper practice in the use of the bath, the prints will assume the violet-purple so pleasing in their tone. But it is necessary to allow them to remain in the gold until sufficient of the metal has deposited to procure that result, and this alone can be ascertained by experiment.

THE AMMONIA NITRATE SILVERING FOR ALBUMEN PRINTS.

This process is somewhat different from other preparations for albumen, but will be found to work successfully.

The paper is silvered with a solution prepared as follows:

Nitrate of silver . . .	120 grains.
Water	1 ounce.

To one drachm of this solution, add aqua-ammonia gradually, drop by drop, until it becomes clear. Then add the remainder of the seven drachms, and three drachms of pure alcohol ; also fifteen drops of nitric acid. Add water until the whole solution equals two ounces of liquid; filter, and it is ready for use. Silver as usual. Should the glaze on the albumen be injured by contact with the solution, add more alcohol and acid.

Tone in a bath prepared as follows:

Chloride of gold	2 grains.
Water	1 ounce.

Neutralize with bicarbonate of soda, and add the following:

Acetate of soda	8 grains.
Water	1 ounce.

Wash the prints, which must be deeply printed, as in the alkaline toning bath (see page 240), and fix in a saturated solution of hyposulphite of soda, and finish by well washing.

ANOTHER BATH FOR TONING ALBUMEN PRINTS, CALLED THE HOT-WATER BATH.

This bath is used by some operators, and it possesses some peculiarities that may be deemed worthy of practice.

The prints are prepared in the same manner as in the former alkaline bath, and washed in the same degree, when a bath is prepared as follows:

Chloride of gold (pure) . .	15 grains.
Water	15 ounces.

Also,

Chloride of calcium . . .	15 grains.
Water	15 ounces; filter.

When the print is prepared for toning, as in the former process, take equal parts of the gold solution and the chloride of calcium solution; mix. Then heat it over a spirit-lamp, or the fire, which must be done in a porcelain evaporating dish. Then immerse one print in the solution, for trial, and if the proportions are correct according to the strength of the gold, the result will be desirable. But if grayish spots appear in the print on holding it up to the light, the solution needs more of the calcium. Litmus paper will be found useful as a

test. These print stone much quicker in warm water than in cold, as heat imparts electric action to the process.

They are then to be submitted to the hyposulphite bath, precisely as in the other process, and well washed.

The advantages of this bath when successfully employed, are its great quickness of action, for the prints will tone almost as soon as immersed. For large establishments this may be deemed worthy of adoption.*

The chloride of gold used in toning the albumen prints must in all cases be such as can easily be rendered alkaline. That which is prepared by the author of this work, and has been in use for nearly twenty years, is the best adapted for the process.

It is made with special reference to this practice, possessing just enough chlorine to retain its bleaching qualities. Indeed, it is prepared so as to con-

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* The author deems it proper to state in this connection that he is under many obligations for valuable hints, to Nicholas Pike, Esq., of Brooklyn, N. Y., who has been a successful photographer for many years, and has, no doubt, experimented in the alkaline bath more extensively than any other artist in the United States, being for many years a correspondent of the great "lights" of photography in Europe, such as Hardwick, Dr. Diamond, Scott Archer, and others.

form to the formula for the production of the auro-chloride of sodium. Hence its rapid and increased sale since the introduction of the *Cartes de Visite.*

THE IMPERFECTIONS IN TONING ALBUMEN PRINTS.

It not unfrequently happens in the process of toning with the alkaline baths that various imperfections will occur.

The print will not change from the red tone on immersion in the gold bath. This is generally owing to an insufficiency of silver in silvering the paper, or a weak negative; add silver, and make more intense negatives.

The most frequent imperfection, and that most difficult to overcome, is the mealy appearance of the print on removal from the gold bath, as seen by transmitted light. This is owing to imperfections in the paper or the albumen, or more generally to improper washing. To avoid this, use more careful washing, and instead of immersing the print in common salt, use the following:

Acetate of soda . . .	10 drachms.
Water	1 pint.

Immerse for five minutes: then wash for a few

moments in running water; then tone, and all mealiness will be avoided.

HINTS AND SUGGESTIONS ON TONING, ETC.

The practice of using gutta-percha, india-rubber, and porcelain for photographic dishes, has been found to be objectionable.

India-rubber, gutta-percha, and porcelain, will not answer for the nitrate of silver bath, although it may for toning and for washing dishes.

The glass baths and dishes are now the only kind that can be strictly relied upon, hence they will soon come into general use.

Care should be taken that only glass dishes be used when nitrate of silver is present, as it will invariably dissolve the glazing on porcelain and earthenware.

The gold toning baths will answer if made of porcelain, or vulcanized india-rubber; yet glass is always preferable.

In toning prints great care should be observed that no foreign substance be allowed in either the gold or fixing bath, as it will assuredly injure the prints. The baths must be entirely discarded and new ones substituted. Even the placing the

fingers in the gold bath, and then in the hyposulphite, or *vice versa*, will impair their utility. Always wash the hands after toning, before placing them in the hyposulphite bath.

PRINTING-FRAMES.

Those known as pressure frames are the best for *Cartes de Visite*, as they possess a powerful spring. It will press the negative more closely to the albumen paper, which is desirable in all intense negatives. The ordinary printing-boards, however, will answer, if the pressure is sufficient to sustain the negative in close contact with the paper.

MOUNTING THE CARTES DE VISITE.

The print must be first cut of the required size by laying over it a piece of glass, cut the size of the print, and that upon another glass; or it may be cut with a pair of scissors by laying the glass on it, and cutting around the glass.

The gelatine or gum-arabic solution may be used for pasting it upon the cards. The substance known as mucilage, sold at the stationers, is a very useful article for mounting the prints.

The best preparation for them, however, is com-

mon starch, as prepared for the laundry, as follows:

Take any quantity and add to it just so much cold water as will make a thick paste; then add sufficient hot water to thin it, till it becomes like mucilage; when this is cold it will be ready for use.

This starch preparation is much to be preferred before any other pasting substance, as it is much cleaner, and by experiment it has been found to endure longer.

A small quantity is only to be made at a time, as it will change its adhesive qualities after it has been made a few days.

A new lot can be made in a few moments, as it may be required.

After the *Cartes de Visite* are mounted and dried on the card, they are much improved by running them through a machine made expressly for the purpose, called the photographic press, or rolling machine.

They are rendered much smoother, and greatly improved by this process. These machines are considered indispensable in a gallery where *Cartes de Visite* pictures are made.

COLORING THE CARTES DE VISITE.

The *Cartes de Visite* can be colored by preparing an extract of gall, sold by the dealers in artists' materials and water-colors. Though their beauty may be considered improved by some, in the eyes of a true artist they are impaired.

It is only necessary to mix this preparation of gall with the water-colors ordinarily used for photographs, and apply them with a pencil in the same manner.

A slight varnishing will be required after coloring, made of albumen or dextrine, carefully strained, and laid on with a flat brush.

CHAPTER XXII.

ON THE PRACTICE OF THE VARIOUS TONING BATHS—ON THE PRACTICE OF THE NEGATIVE PROCESS FOR CARTES DE VISITE PICTURES.

It seems proper that a detailed experience should be made of each toning bath given in this work, in order to their more successful practice.

In all the baths given, it is impossible to suggest a remedy for every difficulty. It frequently happens that the paper may be at fault. If such is the case, then all the care in the bath will be of no avail. To know if the paper is the cause of the difficulty, try some other quality in the same bath.

It is found by experience of the various baths, that all solutions of gold, after being neutralized, will change so as not to work successfully; therefore, in all toning baths, only such a quantity should be mixed and neutralized at one time as is wanted for immediate use.

The alkaline toning bath, given at page 241, is the one in most general use, and perhaps will work more uniformly than any other.

The quantity of gold given in this formula, can be changed with good results; and there can be no actual waste of the gold, because no more than enough to tone the prints which are immersed in it will be taken up. When a larger quantity of gold is used, it will tone in less time.

It is found by experience, that the best tones are obtained when the gold is in excess, care being had that the whole gold solution shall be thoroughly neutralized when used.

The addition of more of the bicarbonate of soda will frequently improve the tone.

It is absolutely indispensable to keep all the dishes used in every bath, free from any foreign substance, and well washed.

The water in all cases should be soft water, and perfectly pure.

The gold solution can be neutralized by adding the bicarbonate of soda in powder, if preferred, and not in solution as directed in the formula.

THE PRACTICE OF THE NITRATE OF URANIUM BATH.

This bath, which is so highly esteemed by those who use it, requires care and observation. The solutions of gold and nitrate of uranium can remain, but should not be neutralized until they are wanted; and only such quantities of the various solutions used should be mixed, as are wanted for immediate use.

The other baths are to be used the same as directed on the pages where they are given, of course subject to such variations as may be found expedient in practice.

REMARKS ON NEGATIVES FOR THE CARTES DE VISITE.

The quality of the collodion is of great importance in the negative.

A change in the proportions of the iodizers, will sometimes correct the quality.

The addition of more gun-cotton will frequently improve it.

The best proportions of alcohol and ether are found to be about equal parts of each.

Frequent difficulties occur in the quality of glass used for negatives.

A simple and effective method, rendering almost any quality of glass serviceable for negatives, is, after well cleaning, to coat it with plain albumen made in the same manner as described on page 235, omitting the hydrochloride of ammonia. Plates can be coated the same manner as with collodion, and allowed to dry. Then coat with the collodion on the albumen surface.

In the practice of the pyrogallic acid as a redeveloping agent, on page 232, cyanide of potassium can be employed in the fixing solution, and the pyrogallic and silver combined, can be used after the negative is cleared and fixed.

WEIGHTS AND MEASURES.

The weight generally employed in Photography is the apothecaries' weight; but some of the chemicals are sold by avoirdupois; for what reason no one can explain.

Nitrate of silver is usually sold by that weight, as well as most of the liquids. The acids and alkalies, however, are generally sold by apothecaries' weight.

APOTHECARIES' WEIGHT.

1	grain.				
20	=	1	scruple		
60	=	3	=	1	drachm
480	=	24	=	8	= 1 ounce
5760	=	288	=	96	= 12 = 1 pound.

AVOIRDUPOIS WEIGHT.

1 pound	= 16 ounces.
1 ounce	= 16 drachms.
1 drachm	= 26·343 grains.
(1 ounce avoirdupois . .	= 437·5 grains.)

IMPERIAL MEASURE.

1 gallon	= 8 pints.
1 pint	= 20 ounces.
1 ounce	= 8 drachms.

(1 fluid ounce of water weighs 437.5 grains, or 1 ounce avoir dupois.)

FLUID MEASURE.

1 minim	.	.	.	.	=	0·91
60 =	1 fluid drachm	.		=	54·7 avoird.	
480 =	8 =	1 fluid ounce		=	437·5	= 1 oz.
9600 =	160 =	20 = 1 pint		=	8·750	= 1.25 lb
76,800 =	1280 =	160 =	8 = 2 gal'n	=	70·000	= 10 lbs.

(1 pound avoirdupois contains 7000 grains.)

1 pound Troy	.	.	.	.	contains 5760 grains.
1 imperial gallon of water	.	.	.	"	70,000 "
1 imperial pint of water contains 20 ounces, or					8750 "
1 cubic inch of water		"	"	"	252·4 "
1 ounce avoirdupois	.	"	"	"	437·5 "
1 ounce Troy	.	"	"	"	480 "
1 gramme	.	.	"	"	15·4 "
1 decigramme	.	.	"	"	1·5 "
1 litre of distilled water		"	"	"	15,406·3 "

The grain is the unit of weight; but as three standards of weight are employed, much uncertainty and confusion often arise in the mind of the photographer as to which ounce or drachm is meant. The apothecaries' weight is generally understood to be the one employed; but it would save much trouble if the formulæ for the various preparations were always given in grains.

INDEX.

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